Rock Products

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Making Lime in West Virginia

The Plant of the Security Cement and Lime Co., Near Martinsburg, Is a Model Combination Lime and Crushed Stone Operation, Having as Its Features Flexibility, Speed, and Compactness

FROM a deposit of 260 acres of high-grade limestone, opened to a depth of 131 ft. and approximately 1500 ft. long, the Security Cement and Lime Co. is supplying its lime and crushed limestone plant at Berkeley, W. Va., with enough limestone to produce more than 100 tons of lime and 1200 tons of crushed stone per day.

Quarry Operation

An unusual feature of the quarry is that it is divided into three operations. Each operation has been opened to a depth of 130 ft. and is worked on two levels. A county highway which crosses the operation forms a dividing line for the two chief operations. The quarry has been opened on both sides of this highway so that it is now a natural bridge 200 ft. long and approximately 20 ft. in width. The two operations have been connected by tunneling under the road so that the plan of operation is to pull the loaded cars from one quarry to the other, thus using but one incline to remove the loads from both operations.

Inclines and Tipples

Stone for both the crushing and lime plants is loaded by hand, the loaded cars being moved to the foot of the incline by mules. Small Koppel cars of 1½-ton capacity are used exclusively in the quarry as cars of this size are more easily moved about than the larger type usually found in quarries where locomotives furnish the motive power.

The main incline leading to the kilns is 1250 ft. long with an approximate grade of 30 per cent. This incline leads direct from the quarry which is tunnel-connected to the other quarry, and cars from both quarries are pulled to the kilns over it. A double-drum Flory hoist, driven by a 112-hp. General Electric motor, is used for this purpose. This hoist is located on the floor level of the lime plant, which is 60 ft. below the maximum height of the incline and is housed in a dust-proof room in the lime plant proper. The hoist operator is stationed in a lever house on top of the trestle over the kilns where he has a clear view of the incline from the quarry to the point where the cars dump into the kilns.

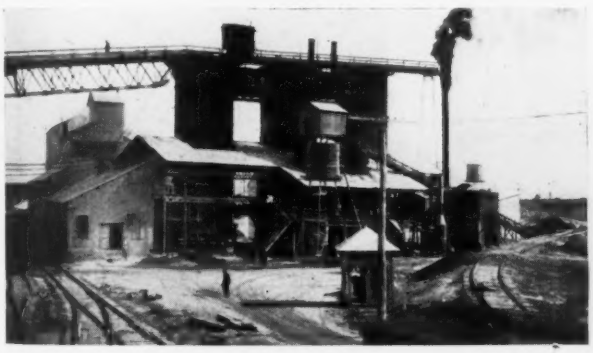
From the third quarry operation the loaded cars are pulled up an incline by a double-drum Lidgerwood hoist driven by a 50-hp. motor. This hoist pulls the loads to the level where they are stored on a siding. From here they are pulled away in trains of several cars each by cable from a second Flory hoist which is driven by an 82-hp. motor. The routes from both quarries are double-tracked to permit the return of empties at the same time loads are being moved.

Crushing Plant

Stone for the crushing plant is dumped midway of the tipple into a chute leading direct to a No. 9 Kennedy gyratory crusher. From there it is discharged into a scalping screen of 2½-in. perforations. Rejections from this screen are moved by gravity to two No. 6 Kennedy gyratories and the products of these two crushers and that of the scalping screen are chuted to a 24-in. belt conveyor which carries the material to the sizing screens in a separate building. This conveyor is provided with housing and a runway its full length.

Sizing Plant

The conveyor discharges direct into a revolving screen 60 in. in diameter by 32 ft.



These three producer-gas kilns produce more than 100 tons daily

At the left is the sizing plant. The housed conveyor leads from the crushers and scalping screens

The main incline. The train of cars at the left has been brought from the third quarry. Dirt from mud seams in the quarry is dumped on the track at the right

Loaded cars are pulled up this incline from the upper level of the third quarry by an individual hoist

Looking into the main quarry from the roadway above. Note the two-level operation and trackage system

The tunnel as it appeared before completion. Tracks through the tunnel now permit loaded cars from both quarries to be taken out over one incline

The gears, pinions, and shafts comprise the gate mechanism of the kilns. The pan-conveyor pit is covered with strips of sheet iron as a safety precaution

long over all. This screen is made up of nine sections having ½, ¾, 1½ and 2½-in. perforations. The flop gates are so arranged that any combination of these sizes may be chuted to any desired bin. The bins span two loading tracks and are also provided with side chutes for truck or wagon loading.

Kilns

The company has three shaft kilns which are 9t. ft. inside diameter at the neck. The kiln heights are in proportion to the degree of incline of the tipple, the first being 57 ft. high, the second 59 ft., and the third 61 ft.

The kilns are fired by producer gas and each producer is equipped with a Chapman floating agitator. The company claims that the use of these agitators increases the efficiency of the kilns in that they give greater volume to the flame. The agitator consists primarily of two arms, or huge

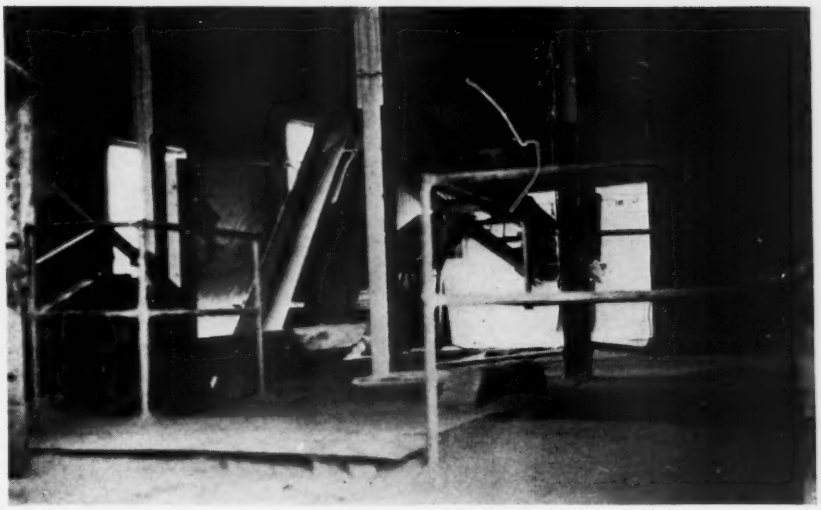
Stone from this level is used exclusively for making lime

paddles, which extend into the bed. These arms are cooled by circulating water passing through them continuously. The speed at which they revolve is five revolutions per hour, although the speed may be regulated at the discretion of the operator. The same water is used over and over in the agitators and is discharged into a 4000-gal. reservoir. The agitators receive their supply of water from a 5000-gal. tank which is used in connection with the reservoir.

Lime Plant

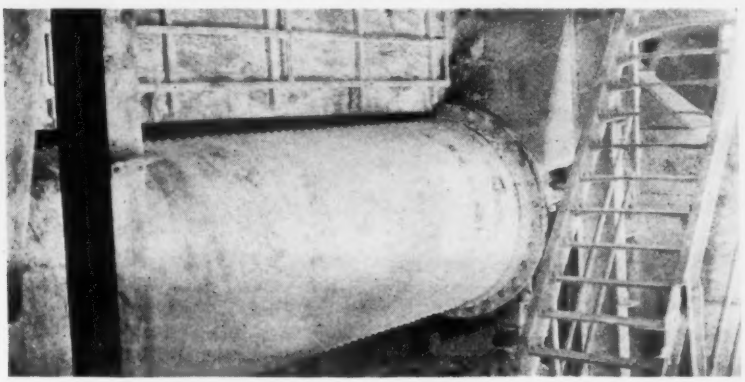
As the lime is drawn it is dropped into a concrete-lined pit, running the full length of the kilns, in which is a Link-Belt pan conveyor. The conveyor is 24 in. wide and 90 ft. between centers, and the discharge end is over another pit which contains the head pulley of a 24-in. belt conveyor, leading from the pan conveyor at right angles to the pulverizer.

A conveyor of special design for loading lump lime in box cars is probably one of the most interesting features of the lime plant. This conveyor is hinged in the center so that when not in use it may be raised out of the way. When let down in



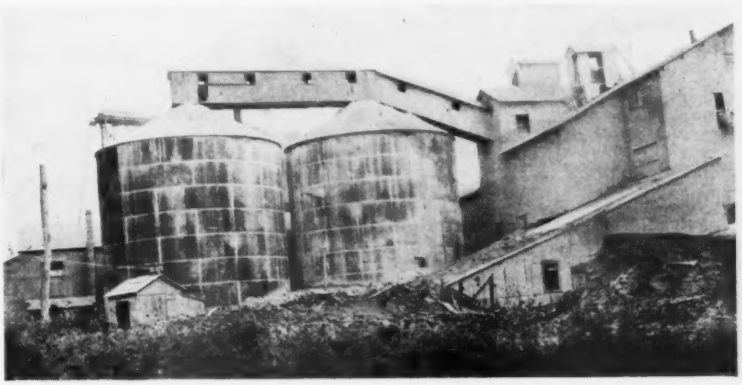
In the pit at the left the conveyor from the kilns discharges into a conveyor leading to the pulverizer. The conveyor in the foreground may be let down for loading lump lime direct into box cars

position it is in direct line with the pan conveyor so that it is the equivalent of a direct conveyor from the kilns to the car. Chutes are so arranged that this elevator may discharge either into a No. 5 Sturtevant screen or direct into spiral conveyors

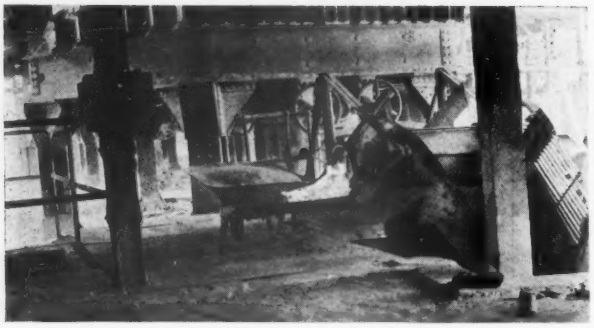


This hydrator of special design is capable of an output of 200 tons per day

The lump lime is ground in a Type B 24x26-in. Jeffrey pulverizer, from which it is discharged into an enclosed elevator. leading to three tanks of 150 tons capacity each. From these tanks the material can be drawn and loaded in bulk form or in



These steel tanks are of 1750 tons capacity each and are used for storing ground lime in slack seasons



The limeshed is of concrete and structural steel throughout. The hand wheels in the foreground control the kiln gates

sacks. Material discharged from the elevator to the screen is here screened to a special grade ranging in size from 20 to 10 mesh and sold chiefly to glass factories.

The spiral conveyors can be changed to discharge on a belt conveyor leading to two steel storage tanks of 1750 tons capacity each. From these tanks the ground lime is removed by underground conveyors which take it back to the hydrate plant or to any one of the three 150-ton tanks.

Hydrating Plant

Ground lime to be hydrated is removed from one of the small storage tanks by a conveyor into a special batch mixer tank of 16 tons capacity. In this tank an exact amount of water is added to a certain quantity of lime and is then discharged into the hydrator.

The hydrator used in this plant is of special design. It is of the revolving cylindrical type, is slightly inclined from the horizontal and is 4 ft. in diameter by 30 ft. long. The mixture is agitated by means of paddles mounted on a shaft extending through the entire cylinder which is rotated by a series of gears driven by an electric motor. This hydrator is capable of an output of 200 tons in a 24-hr. period.

The hydrator discharges into an enclosed bucket elevator which elevates the material to an age tank of 18 tons capacity.

The material is fed from the bottom of this tank through a feed roll into spiral conveyors leading to two Raymond separators—a No. 0 and a No. 1. From these machines the finished hydrate is moved by air to storage tanks located directly over three Bates packing machines. Two of the packers are four-spout machines while the third is provided with two spouts.

Other Products

The core taken from the hydrate in the separators is belt conveyed to special bins where it is stored in bulk. This material is later sacked and sold in season as agricultural limestone under the name "Hydra-Calcite."

In addition to this product the company also produces a ground limestone made from the screenings of the sizing plant. This is accomplished by two Fuller - Lehigh mills which reduce the material to a fineness of 85 per cent through a 100-mesh screen. It is then sacked in 100-lb. bags and sold for use as filler for asphalt roads.

Outside Equipment

An Imperial Type 10 air compressor, driven by a 150-hp. synchronous motor, furnishes the power for quarry drills and other air-powered machines about the operation. In addition to this machine, the company keeps in reserve for emergency purposes another compressor of similar make.

One large building, midway of the quarry operations and the plants, is devoted entirely to repair shops. It is divided into three sections, one each for the carpenter shop, machine shop and blacksmith shop. Each is equipped with the most modern machines and appliances so that the company is independent of all outside aid in making repairs to any of its equipment.

Power

The entire plant is powered by electricity. Current is received at 33,000 and stepped down to 440 volts. Inclusive of auxiliary units, the company uses 52 motors, ranging in size from ½ to 150 hp. A section of the large building which houses the air compressors also contains the electrical repair shop. Here all necessary motor and other electrical repairs are made by the company's own men.

Housing Facilities

From an operating standpoint the company believes that steady and reliable men are the best kind to have around its plant. To obtain and keep this type of employes the company owns and maintains 31 houses which are as modern as their location will permit. In addition to the houses there is also a boarding house which provides accommodations for 15 men.

Personnel

The officials of the Security company and those responsible for the successful operation of the plant are: President, Loring A. Cover, Baltimore, Md.; vice-president and general manager, John J. Porter; second vice-president, J. A. Mason; sales manager, W. E. Gardner; secretary and treasurer, A. M. Tyree, all of Hagerstown, Md.; general superintendent, E. F. Alderton; mill foreman, A. R. Couchman, both of Martinsburg, W. Va.

The original plant was designed by E. W. Lazell, Ph.D. At that time it was considered one of the finest lime plants in the world.

A. R. Couchman, mill foreman, at the left; at the right, E. F. Alderton, general superintendent

At the left, the compressor building and electrical repair shop; the building at the right houses the machine, carpenter and blacksmith shops

Research Work in Rock Products

Know Your Material Is the First Step in Extending Its Use— Various Investigations and Experiments Now Under Way

RESEARCH is the watchword of most trade associations today. Only a short time ago most of us thought of the word research only in connection with colleges and scientific schools—in connection with scholars, professors, and doctors of philosophy. Today, it has come to be an accepted term in describing a profitable and popular branch of trade association activities.

A definition of research is "diligent inquiry, examination or study; laborious or continued search after facts and principles." In other words, every prosperous business man applies research to his own business whether he knows it by that name or not. Research was applied to business problems long before it was to scientific or technical ones. Through collective efforts in trade associations business men are getting re-acquainted with it under new circumstances.

With the research work in the portland cement industry every one is familiar. In connection with it every factor entering into concrete construction and concrete products manufacture has been studied and investigated with the object of extending the use of cement. Incidentally, of course, a great wealth of data and information has been gathered of priceless value to users of cement.

With lime most of the research work thus far done by the industry has been in co-operation with users of chemical lime; but the field for research with this industry is almost boundless.

In the gypsum industry much attention has been paid to research in perfecting plaster and other gypsum building products.

In the case of mineral aggregates—except crushed slag—all research work done thus far has been done by users of the material rather than the producers; in fact, probably most of the producers are unfamiliar with this research work. There are, of course, notable exceptions, like the Indiana Sand and Gravel Producers' Association, but generally speaking, architects and engineers know, or pretend to know, more about mineral aggregates, their preparation and use, than the men who produce them.

This condition of affairs is just the reverse of what is now universally considered as good business in other industries; and it is a hopeful sign that associations like the National Crushed Stone Association are now waking up to the possibilities which systematic, collective research work holds out to them.

Research Work on Highways

Just to show the extent of research work under way at the present time, of vital interest and bearing to producers of rock products, in the one field of highway construction alone, is the following list; compiled by Dr. William K. Hatt, director of the Advisory Board on Highway Research, Division of Engineering, National Research Council:

CALIFORNIA. Highway Commission. Experimental treatment of adobe subgrade on section of state highway, being constructed at Solano County between Denverton and Rio Vista.

In order to test different methods of treating adverse sub-soils in order to improve their support for paving, the California Highway Commission will institute a series of experiments on a section of road now being constructed from Denverton to Rio Vista in Solano County. After the contractor has finished the rough grading, including the shaping but not the rolling, the grade to a width of 21 feet when thoroughly dry will be ploughed with a rooter or sub-soil plough until the soil is loosened to approximately the depth to be treated, after which it will be thoroughly harrowed, disked or rolled until the soil is well pulverized. These nine 500-feet ections will then be treated as follows:

Section 1. Mixed with portland cement to depth of 12 in.; ratio 1:10.
Section 2. Mixed with portland cement to depth of 12 in.; ratio 1:20.
Section 3. Mixed with portland cement to depth of 6 in.; ratio 1:10.
Section 4. Mixed with portland cement to depth of 6 in.; ratio 1:20.
Section 5. Mixed with hydrated lime to depth of 12 in.; ratio 1:20.
Section 6. Mixed with pulverized limestone to depth of 12 in.; ratio 1:20.
Section 7. Planed and harrowed to depth of 12 in.
Section 8. Planed and harrowed to depth of 12 in. and 60 per cent asphaltic road oil spread at rate of 3-5 gallons per sq. yd.
Section 9. Planed and harrowed to depth of 6 in. and oil applied as in section 8.

Co-operating agency, U. S. Bureau of Public Roads.

DISTRICT OF COLUMBIA. U. S. Bureau of Public Roads. Studies of the chemical treatment of soils.

To investigate the possibility of so changing the characteristics of certain types of soils by admixtures that their bearing value will be materially increased or their drainage will be rendered more effective. Soils of known high plasticity mixed with various percentages of the following materials:

1. Portland cement.
2. Ground granulated blast furnace slag.
3. Hydrated lime.
4. Mixture of ground granulated blast furnace slag and hydrated lime.
5. Ground slag and "Cal" (calcium oxychloride).
6. Asphaltic materials.
7. Alum.

The following tests are then made: 1. Moisture equivalent. 2. Capillarity. 3. Shrinkage. 4. Retentivity. 5. Bearing value. 6. Absorption. 7. Field studies. Date of beginning, 1920.

GEORGIA. National Lime Association. Use of lime in sand-clay roads.

Georgia. State Highway Department of Georgia. Field construction experiments in connection with current construction by the state and counties of Georgia.

To try out special mixtures of road soils and to test the influence of certain cheap chemicals therewith. Intimate mixing by harrows, plows, and sprinkler to apply chemicals. Date of beginning, July 1, 1922. Co-operating agencies: U. S. Bureau of Public Roads, University of Georgia Road Laboratory, and various county authorities of Georgia.

MINNESOTA. University of Minnesota. Value of marl as a binder in sand roads.

To determine the value of marl in the construction of highways. The work is carried on by a special appropriation by the state for the investigation of marl. Briquetting machine, impact machine, electric drying oven. The properties of marl and sand mixtures are being investigated by comparison with the similar properties of clay and sand. During the summer, short pieces of road bed will be constructed, using different mixtures of marl and sand, and the data will be obtained from these sample roads. Date of beginning, 1922.

DISTRICT OF COLUMBIA. National Lime Association. Use of lime for hardening soft spots in clay roads or sub-base.

KENTUCKY. University of Kentucky. Concrete aggregates.

Fine gravel and sand from the lower Ohio River, sandstone with very fine sand from Eastern Kentucky. Crushing strength as compared with physical properties of stone.

OHIO. National Slag Association, Cleveland. Tests on 200 aggregates.

NORTH CAROLINA. State Highway Commission. Effect of different cements on different sands.

To make use of sands showing by the present tests to be of inferior quality.

TENNESSEE. State Highway Department. Treatment of local low-grade sands to bring them up to a standard.

Organic matter chief depreciatory factor. Investigation has been completed on local low-grade sands on one project only. The trouble with this sand was a uniformity in the size of the sand particles and the problem was to obtain proper gradings and tensile strength tests. Co-operating agency, University of Tennessee.

CONNECTICUT. Hartford City Laboratory. Fineness modulus of sands.

To study the local sands as to their desirability for concrete road construction. The fineness modulus of standard Ottawa sand assumed to be 2.65. The fineness modulus of the sand in question is determined. A theoretical tensile strength yield is then found by dividing the fineness modulus of the local sand by the fineness modulus of the standard Ottawa sand. Date of beginning, 1918.

DELAWARE. State Highway Department. Investigation of local sands.

GEORGIA. School of Technology. Effect of material below 80 mesh in sand on strength and surface finishing of concrete.

In using coarse sands in concrete work, it has been impossible to finish same, but on addition of fines, the finish becomes smoother. Actual investigation on concrete as it is being poured in forms. Tensile strength machine for mortar strength. Date of beginning, June 1, 1921. Co-operating agency, R. C. Campbell Sand Company.

GEORGIA. School of Technology. Effect of proportion of cement to sand on the mortar strength ratio.

To determine the cement that must be used with different sands to produce a 100 per cent strength ratio, in tension and compression. May 1, 1921-December, 1921. Co-operating agency, Chehaw Sand and Gravel Co., Atlanta, Georgia.

MAINE. University of Maine. Amount of cement necessary for Maine sands to give certain

strength in tension and compression.

To classify types of fine aggregate as to their relative desirability for use in concrete. Date of beginning, November, 1920. Co-operating agency, Maine State Highway Commission.

PENNSYLVANIA. Department of Highways and Streets, Altoona. Tests on Pennsylvania sands.

WISCONSIN. State Highway Commission. Report of tests of concrete made with screenings for fine aggregates.

To determine the value of screenings as fine aggregate for concrete to be used for road construction. Variables: 1. Coarse aggregates: crushed stone, of three degrees of hardness. 2. Specially prepared mixtures of screenings which varied considerably in dust content from each of these crushed stones. 3. Fine aggregates: consisting of mixtures of screenings and fine, clean sand with the proportion of sand predominating in the mixture. 4. Fine aggregates: consisting of mixtures of screenings and well-graded sands. A few tests were run on the effect of time of mixing on the strength and wear resistance of concrete, using screening with a high per cent of dust for fine aggregate. Smith Six Cubic Foot Mixer. Results based on tests of 114 4⅛x8x19½ in. slabs for abrasion, 78 6x12 in. cylinders, and 66 mortar briquettes. Completed February 23, 1921.

WISCONSIN. State Highway Commission. Report of tests on concrete made with sandstone sand and tailings for fine aggregates.

To ascertain the possibility of using sands made by rolling or crushing poorly cemented St. Peters sandstone (southwestern counties of Wisconsin), either alone or in combination with screenings or mine tailings for fine aggregate in concrete road construction. Specimens made of different proportions and subjected to tests in compression and rattler abrasion test. Completed March 21, 1921.

ILLINOIS. Lewis Institute, Chicago. Structural Materials Research Laboratory. Crushing tests of concrete aggregate; abrasion tests of aggregate.

To determine if the 14-day test is more reliable for preliminary acceptance of sands than the 28-day test. Date of beginning, January, 1922. Co-operating agency, Maine State Highway Commission.

NORTH CAROLINA. State Highway Commission. Comparison of the relation of tension tests of fine aggregates in mortars to the compressive strength in concrete.

PENNSYLVANIA. Lafayette College, Easton. To determine when fine aggregates proportioned on Abrams' design theory will meet 28-day strength requirements.

To determine a test at an earlier period than 28 days for fine aggregates which are proportioned by Abrams' theory to give certain strength of 28 days. May 1, 1922-June 1, 1922.

PENNSYLVANIA. State Highway Department. Comparative relation in strength of cement-sand mortars when proportioned by volume and weight.

Ottawa and various other sands, mixed 1:2, and 1:3 by weight and volume and tested in tension and compression. Completed 1920.

TENNESSEE. University of Tennessee. Tests of Tennessee sands as a fine aggregate for concrete.

To determine relative strengths of concrete made from Tennessee sands and the value of the Ottawa sand test as a criterion for the value of sand. Co-operating agencies: Tennessee Highway Department and University of Tennessee.

MISSOURI. University of Missouri. Physical properties of Missouri sands.

NEW HAMPSHIRE. State Highway Department. Study of New Hampshire sands to be used in concrete.

To determine, if possible, whether or not granite sands show disintegration in concrete over a period of two years. May 1, 1922-May 1, 1924. Co-operating agencies, U. S. Bureau of Public Roads.

OHIO. State Highway Department. Apparent specific gravity of fine aggregates.

Determination of the apparent specific gravity of fine aggregates. 500 cc. glass stoppered cylinder. 500 grams of dried clean sand placed in cylinder; pour in about 20 cc., or sufficient kerosene to saturate sand grains; shake; introduce 250 cc. of water; shake vigorously to bring excess kerosene to top; read water level; from volume displaced compute apparent specific gravity. Completed 1917.

PENNSYLVANIA. State Highway Department. Wear tests on mortars containing different sands.

To determine for sands the relation between strength and resistance to wear under abrasion when mixed in mortars of the same proportion. Dorry hardness machine with special holders for inserting 2x4-in. mortar cylinders under definite loads. 20,000-lb. compression machine. Completed 1921.

COLORADO. Agricultural College. Effect of washing sands containing excess silt.

CONNECTICUT. Hartford City Laboratory. Colorimetric tests on sand.

Effect of organic impurities on our local sands. Date of beginning, 1918.

DISTRICT OF COLUMBIA. U. S. Bureau of Public Roads. Method for detecting and neutralizing deleterious substances in concrete aggregates.

A. Detecting deleterious substances in aggregates. To develop a simple method for detecting substances harmful to cement mixtures. Study of those sands which give low strengths with no apparent reason, i.e., sands of good quality and grading. B. Neutralizing deleterious substances in aggregates. To develop methods for neutralizing the harmful effect of the common deleterious substances such as organic matter and alkalin salts when found in concrete aggregates.

PENNSYLVANIA. State Highway Department. To determine the effect of coal on the strength of sands.

To determine the amount of anthracite or bituminous coal in sand which is harmful for use in concrete roads. Powdered anthracite and bituminous coal in varying proportions added to natural sands for tension and compression tests. Completed 1921.

PENNSYLVANIA. State Highway Department. Determination of clay and silt in concrete sands.

To obtain comparative results between volumetric and gravimetric methods of determining loam in natural sand so that the field tests are comparable to laboratory results. Date of beginning, 1921.

VIRGINIA. Polytechnic Institute. The effect of organic matter in sand.

VIRGINIA. State Highway Commission. Organic matter in sand.

To determine if the cause of failure of sands containing organic matter is of a chemical or physical nature. Chemical treatment and comparative mortar strength tests of treated and untreated sand. Begun in 1916 by Mr. Shreve Clark at Columbus, Ohio, in Ohio State Highway Testing Laboratory.

WISCONSIN. State Highway Commission. A tentative adopted plan for making silt tests.

Two glass bottles, jars, or graduates, which have uniform bore over a depth of 8 in. The minimum diameter should not be less than 1½ in. Fill vessels 2½ in. with two representative samples respectively. Add water to make total depth 5 in. Shake for 30 seconds, allow to stand for one hour. Read depth of silt to nearest 1/100 in. Read depths of sand and silt making four measurements at different points. If per cent of silt exceeds the eight per cent standard, allow to stand for four hours and read again. If per cent still exceeds the standard, reject, or send 25-lb. sample to testing laboratory. Completed January 1, 1922.

DISTRICT OF COLUMBIA. U. S. Bureau of Public Roads. Study of the wear-resisting properties of concrete aggregates.

To determine effect of variations in quality and size of coarse aggregates on the resistance to wear and strength of concrete used in road construction. Information sought on (a) relations existing between the wear and strength of concrete, (b) relation existing between the wear of concrete specimens and wear of aggregates used, and (c) the relation existing between the wear and strength of concrete specimens in which the size of the coarse aggregate varies. To determine the effect of variations in the type, quality and grading of fine aggregate on the wear and strength of concrete used in road construction. Information is sought on (a) relation existing between the wear and strength of concrete in which different types of sand, stone and slag screenings are used as fine aggregates, (b) whether the usual laboratory tests for fine aggregates furnish a reliable index of the resistance to wear and crushing strength as determined by this investigation and (c) the influence of mechanical analysis of the fine aggregate on the wear and strength of concrete. Date of beginning, July 1, 1921.

GEORGIA. School of Technology. The relation between strength-ratio of sand, abrasion tests of stone, and strength of concrete.

Slag coarse aggregate moulded with sands of different strength-ratios and 28-day compressive strength on 6x12-in. cylinders obtained. Aggregates of different abrasion losses (slag-stone-gravel) were used with the same sand and compressive strength obtained as before. Date of beginning, January, 1920.

ILLINOIS. Department of Public Works and Buildings. Determination of the effect of hardness of stone on the transverse strength of concrete.

To determine if the hardness of rock, indicated by its French coefficient, has any relation to the compressive and transverse strength of concrete. Tests at 30 days and 60 days. French coefficient of soft stone averaged less than half of those of the hard stone. Absorption of soft stone, two per cent; of hard stone, five-tenths per cent. January 17, 1922-March 30, 1922.

ILLINOIS. Lewis Institute, Chicago. Structural Materials Research Laboratory. Concrete-making properties of large-sized aggregates.

Compression tests on 8x16-in. concrete cylinders using pebbles, crushed limestone, trap, granite, and slag up to 4 in. in size.

ILLINOIS. Lewis Institute, Chicago. Structural Materials Research Laboratory. Concrete-making properties of coarse aggregates.

MINNESOTA. University of Minnesota. The effect of weathered and unweathered feldspar on concrete mortars.

To determine what effect feldspar in a weathered and an unweathered condition will have on portland cement mortars. Several series of briquettes have been made, using sand on a given grading and containing different amounts of feldspar, both weathered and unweathered. Briquettes are tested at the age of seven and 28 days. June, 1921-June, 1922. Co-operating agency, Geological Department, University of Minnesota.

MINNESOTA. University of Minnesota. Suitability of certain limestones and sandstones of the state for use in concrete pavements.

To determine whether some of the rocks found and quarried in the state which fail to meet some of the present requirements of the Minnesota Highway Department, but which in many cases can be produced and delivered to the job at a lower cost than some of the better rocks, should be used in concrete pavement. Concrete cylinders (5x12) were made of Fowler and Pay limestone, Minnesota Crushed Stone Company limestone, Kettle River Sandstone, and Dresser Junction trap, using a 1:2:4 mix. One-third of these cylinders were subjected to a condition of alternate freezing and thawing, one-third were given laboratory conditions. These cylinders will be broken at the age of six months. The other third have been placed out in the open, where they will be exposed to varying weather conditions. These cylinders will be broken at the age of one year. Begun December, 1921. Co-operating agencies, Illinois and Iowa State Highway Departments.

NEBRASKA. Omaha Testing Laboratory. Experiments on stone and sand-gravel to determine their relative value as aggregate for concrete.

NEW YORK. Cornell University. Washed culm as aggregate for concrete.

Date of beginning, September, 1921.

TENNESSEE. University of Tennessee. Tests of Mascot chats as a concreting material.

To determine comparative strength and increase in strength with age, as well as effect of freezing on concrete. Ordinary compression cylinders, cured at laboratory temperature, and broken in ordinary way. Freezing accomplished by placing

in 2[illegible] blocks of ice and frozen with ice in plant. September, 1921-June, 1922. Co-operating agencies, Holston Quarries, Kinzel Thompson Sand and Gravel Co.

WASHINGTON. City of Seattle, Engineering Department Laboratory. Test for strength and wearing quality of sandstone concrete for pavements.

To find out if concrete pavement made of sandstone aggregate could be used on grades to stop skidding in place of sandstone blocks. Slabs for transverse test 17x48-in., with varying thickness, 6x12-in. concrete cylinders. January 19, 1922-April 10, 1922.

DISTRICT OF COLUMBIA. U. S. Bureau of Public Roads. Standardization of a crushing strength test for rock.

To determine the most accurate method of obtaining the resistance to compression of stone used as concrete aggregate and in stone block pavement construction. Determine the effect of the following variables on the crushing strength: 1. Rate of speed of application of load. 2. Shape and dimensions of the test pieces. 3. The condition of the bearing surface of the test piece. Examination of the effect of each factor. Date of beginning, July 1, 1921.

WISCONSIN. State Highway Commission. Results of abrasion tests on crushed stone compared with those on gravel.

To secure information concerning the results from abrasive tests made on crushed rock in the sizes actually used for concrete aggregate. The tests were made in Deval cylinders of plain and slotted type on six samples of crushed stone and four samples of gravel. Each aggregate was graded in two sizes, material passing a 2-in. screen and held on a 1-in. screen, and material passing a 1-in. screen and held on a ½-in. screen. Completed November 3, 1920.

INDIANA. Purdue University. Study of gravel aggregates to determine economy of production, in relation to technical properties of gravel for concrete.

Co-operating agencies, U. S. Bureau of Public Roads; Indiana Sand and Gravel Producers' Association.

INDIANA. Sand and Gravel Producers' Association, Indianapolis. Methods of packing or consolidating gravel.

IOWA. State Highway Commission. Effect of shale pebbles in aggregates on the quality of concrete.

Date of beginning, December, 1921. Co-operating Agency, Minnesota State Highway Department.

MINNESOTA. University of Minnesota. Effect of shale pebbles in concrete and removal of shale from gravel.

To determine the effect of shale pebbles on the compressive strength of concrete and to devise laboratory and commercial methods for removing shale from gravel. Forms for concrete cylinders, flotation apparatus for removing shale from gravel, 2000,000-lb. compression machine. A number of tests have been made on concrete containing different amounts of shale and subjected to alternate freezing and thawing conditions. Methods of separating shale from pebbles have been investigated. March, 1922.

INDIANA. State Highway Commission. Development of abrasion test for gravels.

INDIANA. Purdue University. Abrasion tests on road materials.

To correlate the wearing qualities of stone and gravel. 1. Determine the French coefficient of stone under standard test. 2. Wear crushed stone down to size and shape of gravel. 3. Run tests on (a) stone-equal parts of ½-¾, ¾-1, 1-1½, 1½-2, (b) gravel-equal parts of ½-¾, ¾-1, 1-1½. 4. Make synthetic mixtures of various sizes of graded stone and gravel and test as in above 3. Date of beginning, March, 1922.

DISTRICT OF COLUMBIA. U. S. Bureau of Public Roads. Study of laboratory tests for determining quality of aggregates used in concrete.

To develop laboratory tests for determining the quality of aggregates for use in concrete, viz., stone, gravel and sand.

INDIANA. State Highway Commission. Adoption of abrasion test for stone chips as delivered.

IOWA. State Highway Commission. Tests of stone used in aggregates for concrete paving.

To determine those physical characteristics of Iowa limestone that vitally affect the quality of concrete, and to devise tests that will consistently indicate variations of these characteristics. Deval machine, with standard and slotted cylinders. Date of beginning, December, 1921.

IOWA. State Highway Commission. Durability of limestone aggregates.

To determine a practical test for the durability of limestone in pavements. Accelerated weathering tests, freezing and thawing, chemical analysis, and soundness tests. Date of beginning, April, 1922.

PENNSYLVANIA. Lafayette College. Effect of variations from those required by specifications in the size of screen openings and effect of location of samples and method of sampling of stone.

To determine, if possible, the allowable variation in size of screen opening which may be permitted without materially affecting strength concrete. Specimens will be taken from screens of different makes and angles and samples will be taken from different car loads and from different parts of the same car loads when car loads have and have not traveled considerable distances. March 12, 1922-September 15, 1923. Co-operating agency, General Crushed Stone Co., Easton, Pennsylvania.

OHIO. State Highway Department. Abrasion test for gravel.

Design of wear test for gravel aggregates to be used in concrete wearing course or gravel roads. Deval cylinder—6 cast iron spheres, 1.875-in. in diameter, weighing 95 lb. each as specified by the American Society for Testing Materials for standard rattler test for paving brick. Gravel screened through the following circular screens: 2-in., 1½-in., 1-in., ¾-in., ½-in. After drying, the following weight taken: 1250 grams each 2-in.-1½-in., 1½-in.-1-in., 1-in.-¾-in., ¾-in.-½-in., total 5000 grams. Speed, duration of test, etc., same as standard Deval test for stone. See Bulletin 949, U. S. Bureau of Public Roads. Completed 1914.

MISSOURI. University of Missouri. Physical properties of Missouri gravel.

NEBRASKA. Department of Public Works. Platte river sand-gravel aggregate.

NORTH DAKOTA. University of North Dakota. Lithology of the gravels of North Dakota.

To determine the kind of mineral fragments composing the gravels. Pebble counts and microscope. Taking representative samples and identifying the pebbles. Date of beginning, June, 1921. Co-operating agency, North Dakota State Highway Commission.

INDIANA. Purdue University. Tolerance of coarse aggregate passing the one-quarter inch sieve as affecting specifications for gravel aggregate.

To determine to what extent coarse sand in washed and screened gravel affects the strength of concrete. Three series of tests were undertaken. 1. Effect of variation in sizing of aggregates upon the strength; 2. Effect of various amounts of grits in sand upon the strength of mortars; 3. Effect of various amounts of coarse sand in gravel upon the strength of concrete. American Concrete Institute, 1921. June, 1920-September, 1920. Co-operating agency, Indiana Sand and Gravel Producers' Association.

DISTRICT OF COLUMBIA. U. S. Bureau of Public Roads. Study of blast furnace slags for use in concrete.

To determine the concrete-making properties of blast furnace slags from a large number of producing plants. Date of beginning, 1919. Co-operating agency, National Slag Association.

CALIFORNIA. Leland Stanford University. Mortar-making values of California sands.

Study of California sands with reference to strength of mortar and concrete, 1917-1919.

NORTH CAROLINA. State Highway Commission. Material survey.

Material Survey Organization: Material Survey started September, 1921, and includes location of materials suitable for all types of highway construction. It is divided under two heads: 1. Hard surface construction. 2. Sand-clay, top-soil, and gravel construction. Organization for hard surface construction: one man is sent to locate available sources within economic hauling distance of any given project as soon as the survey for location of road is authorized. He obtains all preliminary data regarding each deposit and takes samples from each deposit and reports information to sampling party which follows and takes samples from each deposit and checks the preliminary survey. Samples are sent to laboratory and tested. Information regarding the samples representing material which is acceptable for the work is given the contractor at the time the proposal is taken out. This information is in pamphlet form and consists of a map upon which is shown the line of the road and the relative location of the material deposits available for that particular project with the names of property owners and estimated quantities.

The local deposits are not guaranteed with reference either to quality or quantity, but the contractor is given all the information available and required to investigate each deposit and satisfy himself regarding its suitability. As a result of furnishing information regarding local information, savings up to sixty thousand dollars on single projects have been accomplished.

For reference purposes, all deposits are filed with the county as a unit. A list of the producers on a commercial scale is also furnished with the material survey data.

On sand-clay, top-soil, and gravel road work, the survey consists mainly of locating suitable pits to eliminate as much haul as possible and determine the most suitable material available for the given road.

OREGON. State Agricultural College. Concrete sands of Oregon.

PENNSYLVANIA. State Highway Commission. Road material survey.

The information is secured for the contractors. Similar to plan described in report from North Carolina State Highway Commission. The following forms indicate the character of the work; and information supplied.

COLORADO. Geological Survey. Cement possibilities, satisfactory for the establishment of plants.

To locate cement materials for private industry and for prospective establishment of state cement plants. Chemical analysis, Kilus testing apparatus. Date of beginning, 1902.

IDAHO. University of Idaho. Clay and cement investigation.

See Bulletin No. 2, Bureau of Mines and Geology, Preliminary Report on Clays of Idaho.

IOWA. State Highway Commission. Investigation of mortar-void theory of proportioning.

To find method of using poorly graded sands in concrete. September, 1921, date of beginning.

IOWA. State Highway Commission. Practical use of excess sand in concrete mixtures.

See *Engineering News-Record*, November 17, 1921, and Proceedings of American Society for Testing Materials, 1922.

Besides the research work listed above, there is an immense amount of other research under way on the properties of concrete. It should be obvious that every producer ought to be in the closest touch with the research work going on in his own locality and be in a position to take advantage of its findings. It is equally obvious that the mineral aggregate industries should be so organized as to take an active part in such research and not be mere passive observers.

A Correction

IN the article describing the plant of the Cape Girardeau Portland Cement Co., in the December 30 issue, it was stated that water is resprayed by a motor-driven Heine centrifugal pump. The pump is a DeLaval.

The Design of Sand Plants

No. 3 Continues the Discussion of Settling Boxes and Shows How to Calculate Their Proportions for the Use of Either a Top Current or a Rising Current

By Edmund Shaw
Consulting Engineer, Chicago

IN the December 30 issue of ROCK PRODUCTS the settling box was discussed and some examples of how to calculate it so that it would settle only the sizes of sand that were desired. It was shown that the current might be confined between partitions until it would flow fast enough to carry over not only the clay but the small sizes of sand that were not wanted in the product, and an example was calculated out to show the method.

We may reverse the process in our calculations, and find out at what point in a long settling box we shall be able to find a certain size of sand. This is useful where we desire to make two or three kinds of sand, for different purposes, such as concrete sand, masons' sand and asphalt sand. We will suppose that we are to build a long box to settle these, and we want to know where we shall put our gates and partition.

In all such calculations we have to assume something, and in this case we will start by assuming that the velocity of the current is 2 ft. per sec. We know we can give it that velocity in any box that is wide enough by putting in partitions lengthwise of the box to confine the current, if this should be necessary. So we are safe to start with this assumption.

Our next assumption will be that the grain of sand will have to fall through the current 12 in. in order to be safe—that is, from being carried along farther by the current. This assumption is not based on any calculation, but on experience. With almost any kind of a top current, the force of the current does not extend more than a foot below the water.

Next we shall need to know how far a grain of sand of any size will fall in a second through the water, and concerning this a word of explanation will be necessary.

There are a number of tables of falling rates for the different mesh sizes of sand which have been published. The writer published such tables in ROCK PRODUCTS in the first number of "Sand Settling and Sand-Settling Devices," in July, 1921. But there can be no such thing as an *exact* rate given for any particular size of grain, for grains differ so much among themselves that what is an average grain in one deposit will not be an average grain in the next. The various matters which affect the falling rate of sand grains are fully discussed in the issue referred to. The differences are not great between one table and another, and there would be no need of mentioning the matter if it were not that some one might be puzzled by these differences.

Regarding the table given here, all that need be said of it is that it is founded on the comparatively recent experience of the writer, and it should serve for sand from the average deposit.

TABLE OF FALLING RATES

Size of grain Through Mesh	Size of grain On Mesh	Falling Rate in inches per second
8	10	6.6
10	14	5.1
14	20	3.9
20	40	2.8
40	60	1.5
60	80	1.0
80	100	0.7

If we divide the number of inches in any of these falling rates into 12, we shall have the number of seconds the grain will be carried along before it falls to where the current no longer affects it. Then if we multiply this number of seconds by 2, the velocity of the current in feet per second, we shall have the distance the grain will be carried before it is dropped.

Let us suppose, for illustration, that we want to split the sand at about 20 to 40 mesh, by putting in a partition. This mesh sand falls at the rate of 2.8 in. per second, and 12 divided by 2.8 is 4.28, about. This is a little over 4 ft. and 3 in., so if we set our partition 4 ft. and 3 in. from the end of the box we should get the split we desire.

If we want to make the next split at from 60 to 80 mesh, we divide 12 by 1, the falling rate for this size of sand given in the table, and have 12 as the quotient. In 12 secs. the current would flow 24 ft., so we would put in our next partition at that point. And it is evident that we would have a very long box indeed, if we were to try to save the sand finer than 100 mesh.

Here we have run against the common-

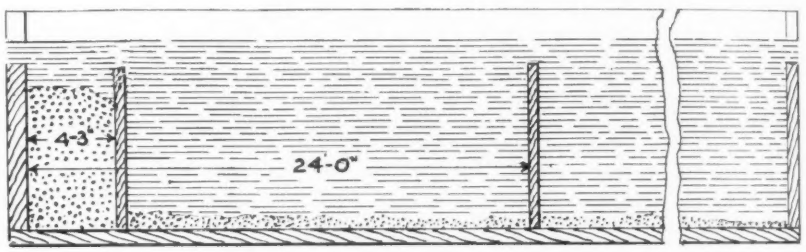


Fig. 11. Showing the difficulty of placing partitions in a long settling tank, so that sufficient space will be given to the coarser sizes

est difficulty with which the designer of sand-settling boxes is confronted. The first compartment, as shown in Fig. 11, is much smaller than the second, and yet the sand which is to settle in this compartment is much greater in quantity than the sand which is to settle in the second compartment. We would like, if possible, to reverse this; so that the coarser sand will settle in the larger compartment, for the sake of getting equality in storage space.

There are two or three different ways by which the compartments may be proportioned to the amount of sand that is to be settled in them. Fig. 12 illustrates one of the oldest of these methods, which is that of slowing down the current by making it wider. If we start with a current of 2 ft. per sec. we can reduce the velocity to 1 ft. per sec. by making it twice as wide. If we are using partitions in the first compartment to get the required velocity, we can set them at twice the distance from one another in the second compartment, and set them proportionately wider in the third.

The partitions in the diagram, Fig. 12, are calculated so that the current in the

first compartment is 3 ft. per sec., in the second compartment, 1 ft. per sec., and in the third, 6 in. per sec. The partitions are set so that sand from ¼ in. to 20 mesh will settle in the first compartment, from 20 to 60 mesh in the second, and from 60 to 100 in the third.

We have seen that we could make the finer sand settle by making the current wider. We can attain the same result by making it longer. What we want to do is to give the grain of sand time to settle 1 ft., and we reach the same result both by slowing down the velocity of the current and by giving it a longer distance through which to flow.

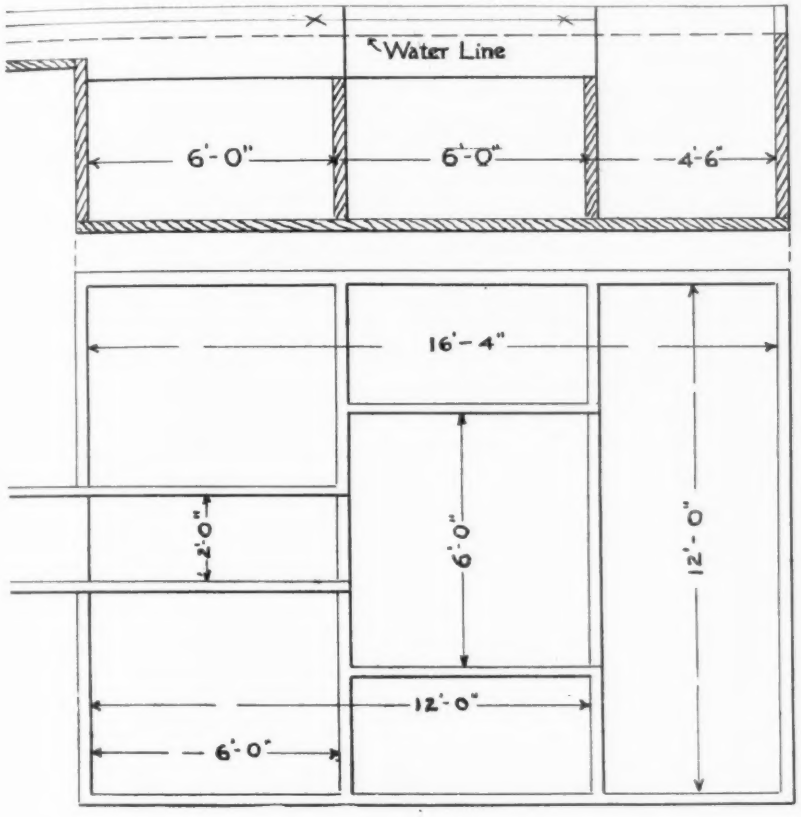


Fig. 12. Plan and section of a settling box in which the velocity of the current is reduced by passing it through wider channels

Fig. 13 illustrates the second method. The current flows between partitions for a short distance and then enters a trough, or launder. It is carried in this to the second compartment where the same method is applied to get it to the third compartment. In this way compartments of equal size may be made to settle sands of different grain sizes. In the figure, the first compartment is settling the sand from ¼ in. to 20 mesh, the second the sand from 20 mesh to 60 mesh, and the third from 60 to 100 mesh, as before. The current all the way through the box has a velocity of 2 ft. per sec.

Where these troughs are used they must be given an inclination to prevent the sand from settling on the bottom, the same as any other troughs which are used around a sand plant. For the sands finer than 20 mesh, an inclination of 1 in. to 1 ft. is generally sufficient, even where the proportion of water to sand is small. For a very dilute mixture, such as we would have in this case, after taking out the sand coarser than 20 mesh, a much less inclination will serve. The troughs in the diagram are supposed to have an inclination of ¼ in. to the foot.

So far, we have dealt with top currents flowing over a still pool of water. They are much in use in sand plants and the work may be described as fairly good where they are used. But there are certain defects in settling boxes that use them that should be described so that they will be understood, before considering the other kind of current.

Fig. 14 shows a section through such a top current flowing over a partition. The lower part of the current strikes the partition and sets up an eddy, a kind of horizontal whirlpool. This eddy carries down fine sand and a lot of it never gets back into the current to be carried over into the second compartment, where it belongs. Consequently, the coarse sand carries a lot of fine sand, which may or may not be wanted in the finished product. Sometimes this fine sand is badly wanted for grading, in which case the eddy current does no harm. But in case that close separation is needed, the eddy current makes the use of a top current unsatisfactory.

Fig. 15 shows how we may take advantage of this peculiarity of a top current in a settling tank to throw more fines into the coarse sand, when these are wanted for a certain grading. Short upright partitions are placed in the tank so that their tops will be just below the current. The bottom of the current striking these will set up a series of eddies, all of which will serve to settle fine sand.

So far as the writer knows, there is no rule by which the effect of such partitions may be calculated in advance, and the only way to find out how many are needed is to experiment.

Box with Rising Current

The second form of current to be considered is the rising current, and the typical form of a rising current settler is shown in Fig. 16. The water and sand enter behind a partition, pass under the partition and rise on the farther side.

It is evident that grains which are heavy enough to fall against the current will not be raised by the current, and that the grains lighter than this will be raised by the current, so by varying the strength of the rising current we may make any separation that we please.

We vary the strength of the rising current by changing the dimensions of the part of the box through which the current must rise. The larger we make this, the slower the current will rise.

To find out how large we should make this, we may use the primary formula for the flow of water through a channel in any direction, which is:

$$Q=Av.$$

Translated, this says that the quantity of flowing water is equal to the area of the opening through which it passes times the speed with which it flows.

Thus; if we had a channel 1 ft. each way, which would be an area of 1 sq. ft., and the current was flowing at the rate of 10 ft. per sec., the quantity of water passing would be 10 cu. ft. If we wanted to cut down the velocity to 5 cu. ft. per sec., we could do it by making the channel twice as large, or 2x1 ft. If we wanted one-fourth the velocity, we would make the channel 2 ft. each way, always supposing that the quantity of water remained the same.

Of course, we know that the velocity of a current of water flowing through a confined space is not the same in all parts. The friction of the current against the sides of the channel slows it down. In addition, eddy currents are formed which

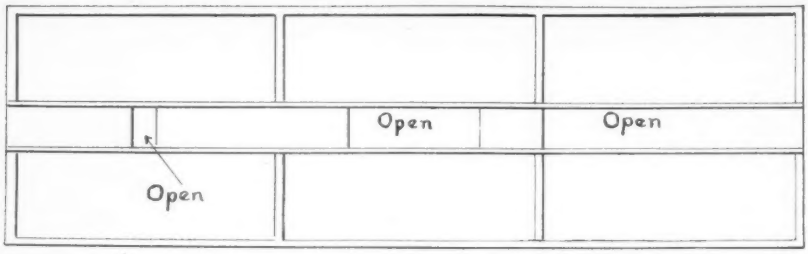


Fig. 13. Plan of a settling box with a current of constant velocity in a trough, with openings proportioned to the size of sand which is to settle

use up some of the force of the main current. But with the currents of low velocity which are found in sand-settling devices, these are such small matters that they may be disregarded.

In order to understand how we shall calculate an area to obtain a current of a certain strength from a given flow of water it will be best to take an example. Let us suppose that we have a flow of

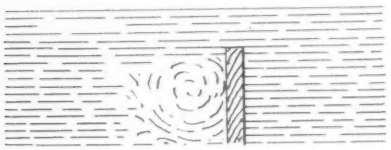


Fig. 14. A top current in a settling box forms an eddy current when it strikes a partition

1,000 g.p.m. to deal with, and that we wish it to make such a current that it will lift grains between 80 and 100 mesh.

Now, 1,000 g.p.m. is equal to 3,850 cu. in. per sec. The falling rate of grains between 80 and 100 mesh we find from the table to be 0.7 in. per sec. Dividing 3,850 by 0.7 we have 5,500 sq. in. as the required area. If we suppose that the area is to be a square, we can find the length of one side by extracting the square root, which is 74.2, about. In round numbers, this is 6 ft. 2¼ in. We must make the box a little over 6 ft. each way.

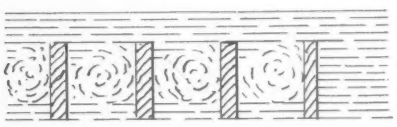


Fig. 15. Short partitions are put in to form a series of eddy currents and settle more fine sand

Within certain limits, we are not obliged to confine ourselves to the square shape, and we can make the box longer and narrower, provided the area is kept the same. If we had a box 6 ft. square, we might substitute a box 9x4 ft. and get practically the same result. But where the box varies from the square, the current should be made to flow the shortest distance to the overflow. This last sentence may be explained by referring to the diagram, Fig. 16. If such a box is 9x4 ft., the distance from the partition to the overflow should be 4 ft. and not 9 ft.

This matter of getting the overflow at the shortest distance from the feed is important. To carry it out, the usual way of feeding a rising current device is in the center, as shown in Fig. 17. This might be a section through a square, a rectangular or a circular tank, and in either case it would give fairly good results as a separator. But the best results would be obtained with a circular tank, in which the overflow would be everywhere at the same distance from the feed spout. And this is the form which is adopted in well-designed classifiers.

Fig. 18 shows how this rising current principle may be applied in a practical way to the design of a practical settling box to use in a sand plant. It is supposed that a flow of 3,000 g.p.m. is to be dealt with, and that the rising current will throw out particles between 80 and 100 mesh; or, rather, that it shall split the feed on this size, throwing out a part and retaining a part. As before, we find from the table that we want a velocity of 0.7 in. per sec. The equivalent of 3,000 g.p.m. is 11,550 cu. in. per sec., and dividing this by 0.7 we have 16,500 sq. in. as the area required.

Suppose that we want to make the box 12 ft. long, which is 120 in. Let us suppose also that we admit the feed to a center channel, which runs the length of the box, and that this is 18 in. wide. The channel will take up 2592 sq. in., which must be added to the 16,500 sq. in. required by the current, making 19,092 sq. in. as the area the box must have, including the feed channel.

Dividing 19,092 by 120 we have 159 in. as the width of the box, which is 13 ft. 3 in.

Fig. 19 shows a section through the completed settling box designed from the figures just given. The feed is passed over a screen above the box and the oversize and trash fall down a slanting apron into the overflow trough which is on that side of the tank, so that it is carried away by the waste overflow water. The sand and water passing through the screen go into the feed channel and the rising current carries the fine sand which is not wanted into the overflow. Gates at the bottom of the settling box permit the sand to be drawn off as required.

To show that this is not merely the academic figuring of a sand-settling problem, it is stated here that a box corresponding to this has been built and that it has been found to do the work for which it was designed.

Changing the Classifications

No device of this kind can be considered very satisfactory unless it admits changing of the classification. The character of the deposit may change, so that more or less fine sand is wanted in the finished product, or the market may de-

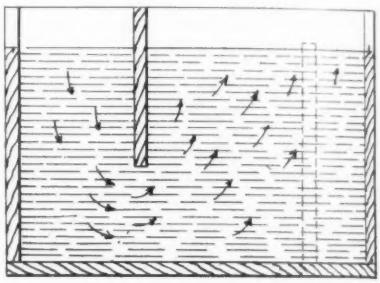


Fig. 16. A rising current is formed by the water passing down one side of a partition and rising in a channel on the other side. The narrower this channel is made, the faster the current will rise

mand a different product. In either case, a change in the classification is needed.

With the top current settlers we have seen that the classification may be changed by either widening the current to make it flow slower or by lengthening the distance through which it has to flow so as to give the grains a longer time in which to settle. With the rising current we have to change the cross-section area of the channel through which the current rises,

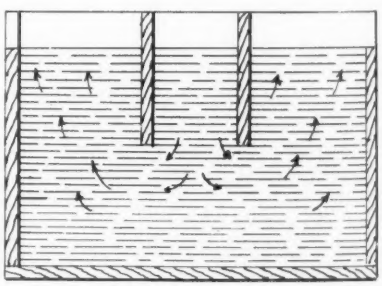


Fig. 17. In a rising current settler, the current should flow the shortest distance to the overflow; hence it is better to admit the feed in a central channel

as was explained in the first part of this discussion.

The only way to change this cross-section area is to put in partitions which will reduce it. In the first diagram relating to rising currents, Fig. 16, such a

partition has been drawn in with dotted lines. Notice that the area can only be reduced in this way, which means that the sand thrown out and into the overflow will always be coarser if a partition is used. If this sand is wanted finer, or, what is the same thing, more fine sand is wanted in the finished product, the only remedy is to build a larger settler or employ two of them. It is often good policy to build a settler too large, for if the sand is too fine, the area may always be cut down by the insertion of partitions.

Automatic Settling Tanks

All automatic settling tanks of which the writer knows employ the rising current in some manner. That is, the feed al-

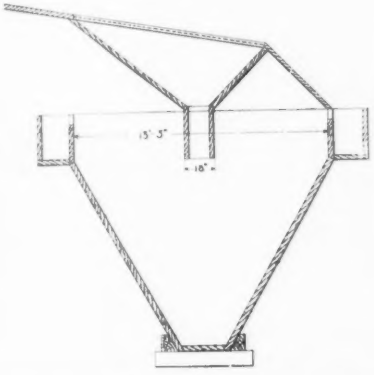


Fig. 18. A practical settling box built from the calculations given in the text for a rising current settler

ways enters behind a partition and passes below the partition and rises on the farther side, exactly as in the diagram, Fig 16. Some of these devices are more intelligently designed than others and so do better work as classifiers.

But all of these automatic settling boxes have a great advantage over the simple settler with hand-controlled gates in that they keep the sand at the same height in the tank. In the first of this series we have seen how this gives cleaner sand, by preventing the settlement of clay. It also helps to give sand that is better classified. If the height of the sand in the settler is constantly changing, the channel through which the water passes is bound to change its area more or less.

With hand-operated gates it often happens that the sand is allowed to accumulate until everything that comes into the settler goes out with the overflow. Even if this does not happen, the channel through which the flow passes may be contracted until very coarse sand is thrown into the overflow.

The following number of this series will treat of automatic settling tanks in connection with bins and open storage.

(To be continued)

A Sand and Gravel Inspection Tour

A TOUR of inspection such as few sand and gravel men have made is being made by C. E. Wood of C. E. and C. W. Wood Co., sand and gravel producers of Los Vanos, Calif. Mr. Wood left California January 7 and is at present in Chicago, where he will spend several days visiting plants in Illinois. He stopped in Kansas City and Des Moines en route, and from Chicago he plans to continue his trip to include Detroit, Oxford, Cleveland, Akron, Buffalo, Rochester, New York, Newton, N. J., Baltimore, Washington, Harrisburg, Pittsburgh, Cincinnati, Columbus, Chattanooga, Nashville, Memphis, Little Rock, Fort Worth, Dallas, San Antonio, El Paso, Los Angeles, and San Francisco. He plans to attend the convention of the National Sand and Gravel Association, at Washington.

The trip will occupy at least six weeks and will probably cover 10,000 miles of territory or more.

Mr. Wood's company at present produces 20 to 25 cars a day, and they plan the erection of another plant with a 1000 ton a day capacity.

NATIONAL CRUSHED STONE ASSOCIATION CONVENTION

EVERY owner, manager, superintendent and official of a quarry company in the United States should plan to attend the National Crushed Stone Association at the La Salle hotel, Chicago, January 15, 16 and 17. Those three days are going to be big ones in Chicago—the Good Roads Congress and Machinery Show as well as the Crushed Stone Convention, will provide lots of new things for you.

Will Exhibit Complete Miniature Rock-Crushing Plant

A RATHER unusual exhibit will be displayed at the Chicago Road Show by the Smith Engineering Works, Milwaukee. This exhibit will consist of a complete miniature rock-crushing plant, driven by a 1½-hp. motor, reducing granite rock from 1 in. down to ¼ in. and under.

The crushing process will be in two steps. A small edition of the Telsmith primary breaker will do the coarse crushing. This machine is 9½ in. in diameter. with 1½-in. feed opening and 7x2-in. drive pulley. It will be equipped with a complete automatic oiling system, similar to that on the regular Telsmiths. The coarser rock will be recrushed in a miniature Telsmith reduction crusher to minus ⅛-in. size. This machine is about 10 in. in diameter with 7x2-in. pulley and ¾-in. feed opening.

This little plant will be equipped with 6-in. scalping and finishing screens; and with continuous bucket elevators equipped with 2¼x1⅛x1½-in. buckets. The bin will be 18x18 in. x 3 ft. 4 in., with bin gates of corresponding size.

President Eames Appoints Committee on Resolutions

THE following named persons have been appointed to serve as a committee on resolutions of the National Crushed Stone Association:

Chairman, Otto M. Graves, General Crushed Stone Co., Easton Pa.; W. W. Boxley, W. W. Boxley & Co., Roanoke, Va.; W. L. Sporborg, Rock-Cut Stone Co., Syracuse, N. Y.; A. J. Blair, Lake Stone Co., Milwaukee; F. W. Schmidt, Morris County Crushed Stone Co., Morristown, N. J.; E. J. Krause, Columbia Quarry Co., St. Louis; Charles A. Freiberg, Buffalo Cement Co., Buffalo, N. Y.; W. C. Swart, Mesabi Iron Co., Babbitt, Minn.; H. B. Allen, Philadelphia; J. F. Schroeder, Linwood Cement Co., Davenport, Iowa; W. H. Hoagland, Marble Cliff Quarries Co., Columbus, Ohio; Norman Hely, Cape Girardeau, Mo.

Both members and non-members are invited to submit written suggestions and resolutions to any member of this committee.

Honors for Richard K. Meads

THE many friends of Richard K. Meade, of the chemical and industrial engineering firm bearing his name, will be glad to learn that his book, "Portland Cement," has been translated into Italian by Federici Federico, director of the Dalmatia Portland Cement Works of Trieste. It will be published by Ulrico Hoepli, Milan, one of Italy's most prominent publishers of scientific books.

As Mr. Federico has used Mr. Meade's work for years in his work as an authority on the manufacture, testing, and analysis of portland cement—and had translated large portions of it for his assistants—he found it so valuable that he decided to make it available for other Italian chemists.

In view of the number of other works published in both English and German dealing with the manufacture of cement, the selection of Mr. Meade's book for the Italian translation is not only a compliment to the author but also to the American cement industry.

The 3% Immigration Law; and ½ of 1% Liquor Law

Where Is This Year's Labor Supply Coming From? Has Prohibition Increased the Efficiency of the Laboring Man?

ONE of the biggest issues that the government of the United States must face in 1923 is what to do about getting man-power for all the work that must be done. There are many factors in the problem, but it is a fundamental one; and failure of big, basic, producing industries to produce, whether the failure is caused by an actual want of labor, or by too high-priced labor, will have a serious effect on our national prosperity.

The opinion of some prominent quarry operators on the seriousness of this labor problem are as follows:

W. W. Wandell, vice-president, New York Trap Rock Co., New York City, writes:

The output of crushed stone at one of our principal quarries, where we were entirely dependent upon hand labor for loading stone into cars, has been cut 50 per cent because of the impossibility of obtaining sufficient labor, while our output at our steam shovel quarries has been very much curtailed because of this same shortage of labor.

We come in contact with all of the principal and largest construction contractors in this entire Metropolitan market, and we have talked to none of those contractors who has not informed us that their business has been seriously hurt and crippled last year because of the impossibility of obtaining sufficient labor.

Because of this shortage a great many of the construction programs for this year are being held up until the authorities are able to determine whether or not it will be possible to obtain sufficient labor to go on with the work.

Many road jobs, and other construction work, have been discontinued for the past two months, the work going over until next spring because of the lack of labor.

We have been informed that the cultivation of many farms in New York state has been entirely abandoned because of the fact that the farm labor has been drawn to the cities and to construction work because of the high price paid for this labor as compared with farm wages.

We believe that this acute shortage of labor is one of the most serious obstacles in the way of returning prosperity, and that the condition is growing worse continuously, and we believe that the only remedy for the condition is the modification of the present immigration law.

Otho M. Graves, assistant to the president, General Crushed Stone Co., Easton, Penn., writes:

The present restrictive immigration laws have no doubt reduced to some extent our labor supply; and this is naturally reflected in wages, but to what extent this is true we are not able to say without somewhat more exhaustive study of our records and with proper allowance for other factors which are also involved in this condition.

Our labor situation is serious as regards a sufficient supply, but the solution of this problem is more involved and complicated than can be made clear in a more or less offhand discussion.

Insofar as circumstances permit, we endeavor to handle our stone entirely by machinery from the time it is shot down to its being delivered in sizes to the freight cars under the bins, and in such quarries as this method is completely followed, we doubt if, at least in the immediate future, any new apparatus will be developed or present machinery so modified as to perceptibly reduce the amount of hand labor now necessary.

J. F. Schroeder, general manager of the Linwood Cement Co., Davenport, Ia., writes:

We should change the immigration laws so that we can have a greater supply of men who are willing to work at common labor than we now have. The writer has in mind that the average young man nowadays, whether or not he is fit for more intelligent work than doing manual labor, feels that it is beneath him, and is not ready and willing to do any and all kinds of work which may come before him.

If it could be taught and instilled into the minds of each and everyone of us to do anything and everything, which might be considered as our daily duty, which comes before us, either mental or physical work, it would very greatly increase the productivity of the present population of the United States and would also greatly relieve the class feeling which is now prevalent.

Even though a man may be a 'white-collar' man, he should not hesitate to do anything physically which might arise from time to time.

The writer has no thought in mind where quarry labor at the present time could be further reduced by machinery; and while we have had no labor difficulties in the last two years, we believe that as soon as industrial activities increase to any considerable degree, we will have difficulties, unless the man-power available will increase its working hours or days, and produce a satisfactory amount while working.

I. W. Wortman, secretary of the Morris County Crushed Stone Co., Morristown, N. J., writes:

The labor question has not been serious with us up until about the first of October. Since that time, common labor has been very scarce. We believe that the immigration laws should be modified to admit a greater number of foreigners of the laboring class.

Most of the plants in this territory have been remodeled so as to do away with a great deal of hand labor, with the exception of some of the smaller ones. I do not think they can reduce the number of employes required to produce material.

J. A. Rigg, secretary, treasurer and manager of the Acme Limestone Co., Alderson, W. Va., takes a different point of view in regard to immigration. He writes:

It is our opinion that in quarries with large production, where they have availed themselves of every possible advantage to be gained by modern machinery, that a limit has just about been reached in the replacement of man-power with machinery. We have no suggestions to offer as to increasing output in such cases. There is a large number of quarry operations like our own, where the demand does not justify the outlay, and consequently we are compelled to use our wits, even more so than the man with large production and large capital, to hold our costs down.

We cannot speak generally of the labor situation in quarries throughout the country, being acquainted with only a few in our own vicinity. We have not experienced any great amount of labor trouble. Personally, we feel that if is a good deal better to have some labor shortage in this country, and all of our labor living on a higher plane, than to have the country overrun by foreign people with the consequent lowering of the plane of living for the working man in this country, to say nothing of the other evils which foreign labor brings to our land.

We attribute our present strict immigration laws to a demand generally from the native citizenship of our country that our government protect us against the pollution of our citizenry by too much ignorant foreign blood, and we are right with them on this policy. We believe that there are a few things in our country that we should put ahead of mere dollars and cents.

A Northwest quarry man, who favors a change in the immigration laws, also emphasizes the larger view of the foreign labor-supply problem as follows:

Restricted immigration is one of the principal causes of a shortage in common

labor in this territory for it seems to be an established fact that our own people are being trained so that they will not seek an occupation which can be classed as common labor. This is true of the children of immigrants as well as children of native citizens or naturalized citizens. Our present method of education tends to raise the standard of living so that these folks do not have to do common labor work, the result of which is that the common labor in this market is entirely made up of foreigners.

In this territory a large part of the industry must be carried on with common labor for we have a large iron mining territory adjacent to us and we also have a steel plant in our midst. The lumber industry is growing smaller each year and does not begin to require the labor that it used to. As long as immigration does not keep up, we are bound to have a shortage of common labor and with organized labor exerting the force which it does today, we have a continual increase in wages.

Our supply of labor for the coming years can only be obtained by bidding against the other employers of labor. This a most expensive way of getting them and if followed would probably bring wages to a point where some of us can not afford to be anything else than common laborers.

New machinery cannot replace the amount of common labor required in a quarry, at least as far as machinery has been developed up to this time for we use steam shovels entirely for handling the material in the quarry. We attribute the existence of our present immigration laws entirely to organized labor, but do not want to see the laws revised to an extent whereby labor can come in in unlimited quantities. It should not be permitted to enter our country faster than it can be absorbed. This is one trouble with the country today. There is a shortage of labor but at the same time we have not been able to absorb or educate the foreigner to a point where he is a good citizen.

Must Provide Decent Houses and Living Conditions

W. J. Strassburger, president, Iron Trade Products Co., Pittsburgh, Penn., emplasizes the importance of adequate housing facilities in dealing with the quarry labor problem:

From the writer's observation, it would seem that we could use a larger labor supply than is permitted by the present restrictive immigration laws. The supply is below requirements in the steel mills, whereas it exceeds the requirements in the coal regions where the highest wages are being paid for common labor, except that during the past few weeks, car supply being worse and employment spasmodic, men have gone into other industries. This situation can best be helped by increased motive power, which is back of the shortage of car supply, it is not primarily shortage of cars.

The housing situation in the outlying mining districts, including quarries, is something that controls labor supply. Men are learning to live better and have a right to expect proper conditions under which to bring up families, otherwise, there is discontent. This means the social or welfare end of employes must be properly provided for, even though it increases cost of production, which must be reflected in a higher sales price, and until all industries realize this, there is certainly going to be fluctuation in price due to the different items included in cost.

F. R. Kanengeiser, vice-president and general manager of the Bessemer Limestone and Cement Co., Youngstown, Ohio., writes:

We feel the effect of the present immigration laws quite keenly. Our labor has been largely foreign in the past and relationships between our older workmen and their relatives and friends in foreign countries brought us a fresh supply of men, who, generally speaking, were efficient men and willing workers. Since this stricter immigration law has been in force, we get very few men from foreign countries, the result being that we have had to resort to colored people, and where common labor is involved, obtain very little efficiency. It is made up of a mixture of American or semi-American good-for-nothings and colored men, who are shifting constantly.

We believe the country could absorb a considerably greater number of immigrants and that labor-saving machinery will be installed just as rapidly as it is proven. The shortage of men and the higher wages will of course be an impetus along this line. I do not believe that anyone can truthfully say that labor-saving machinery has been seriously retarded in this country, due to an excess volume of labor.

Must Not Make Prices Too Far in Advance

A prominent Mid-West quarry operator gives some very helpful suggestions for dealing with the quarry labor problem:

Today common labor is short and the wage trend upward. This year, and possibly for a period thereafter, the supply of labor will continue less than the demand—the price therefore correspondingly high. Unless labor resorts to strikes to gain their ends we do not believe that during the next few years the labor shortage will be much more acute than at present. The labor wage, however, will doubtless continue to advance under the sustained excessive demand. While we do not believe labor shortage will seriously curtail production, it is probable that development work will suffer.

As to improving labor supply, we have little to suggest other than the passing of less restrictive immigration laws as to numbers with very rigid restrictions being maintained as to the qualifications of the individual prospective immigrant.

The effect of fluctuating labor prices, while not desirable, is not particularly dangerous unless the quarry operator binds himself for sale of his material for a period too far in advance. Labor is highest when materials are most in demand. The operator is therefore enabled to at least in part keep his selling price in proportion with his labor wage. We can see no immediate remedy for this fluctuation in labor price.

A considerable amount of quarry labor can ultimately be replaced with labor-saving devices. The installation of electric motors for power; of electric shovels, and finally of electric haulage systems permits of quarry operation with less men. Also caterpillar-type shovels adapted to quarries having level floors should make the use of pitmen unnecessary.

As to the average daily output of stone per man, no accurate estimate can be given due to the widely varied conditions under which stone is produced at different quarries. Naturally the only method of increasing the output per man is either to increase the output without additional help or to reduce your labor requirements for a given output. Possibilities as to installing labor-saving devices to that end have been referred to. Shortage of quarry help, particularly of common labor, is really acute and will remain so as long as business remains good. Increasing immigration is doubtless the quickest and best solution. Surely with conditions as they are in Europe today we should experience no difficulty in securing large numbers of proper qualified immigrants should our present laws be changed to permit of increased immigration.

Some the same idea of the relation of wages to prices was probably in the mind of an Eastern operator when he wrote:

The greatest trouble we see in the quarry business today is the ruinous competition. Quarry men seem to largely have the impression that their only function is to employ labor and pay machinery and repair bills. The item of return to the owners or stockholders does not seem to enter into the matter. They go out and make a contract to furnish stone at a certain price, and then try to force their labor to accept a wage scale low enough for them to come out. Until this practice is discontinued we do not expect to see quarrymen get away from their labor troubles.

More Immigrants from Northern Europe Desirable

A Wisconsin quarry man of many years experience writes:

I am in favor of a selective immigration law. I doubt if the present act accomplishes just what is desired, and that is getting a better class of immigrants. All the present act does is to limit the immigration to a certain percentage of nationalities resident in the United States at the time of the last census. I recently saw a suggestion made that this percentage of immigration should be based on the 1900 census. Previous to that time most of the immigration to this country had been from the Northern countries of Europe and such peoples have always become Americanized and been a valuable addition to our citizenship. In the last 20 years the immigration has been more largely from the Southern countries of Europe and they have not mixed well.

I believe that nothing is worse for this country than to have any extensive unemployment. In the production of crushed stone, sand and gravel, no great amount of common labor is now required, and I believe that it can be almost entirely eliminated by the use of machinery. Our great trouble has been to get common labor to load heavy riprap stone. In the quarrying of this class of stone a considerable quantity of smaller stone is produced which can only be handled by labor.

It is a hard job to get men now to do this class of work. I believe that for industries such as ours we have got to get enough for our material to enable us to

pay high enough wages so as to make our work as attractive to the ordinary man as work in a machine shop, foundry, etc., taking into account the loss that a man will incur in working for us due to the short season and rainy days. Until we can do this we are always going to have a labor problem confront us except at such times as there is an over-abundance of labor, and, as stated, I do not believe this is a good economic condition for the country to be in.

When I first went in the stone quarry business 32 years ago, most of the common labor that we were getting at that time was Polish. But a few of this class of labor are now left with us. Most of them after working for us for a few years would send over to Poland for their relatives and then they all gradually took up small pieces of land either in the vicinity of our quarries or else moved up into the cutover regions in North Central Wisconsin. They and their descendants have all become good American citizens. Quite a number of these Polish boys were across in France during the last war. If that class of immigrant can again be induced to come to America, I believe they should be welcomed, but I do not believe that we want any more of the immigrants from Southern Europe if we are going to preserve our American ideals.

Has Prohibition Helped Labor?

The majority of quarry operators evidently believes that in spite of personal prejudices national prohibition has been a good thing and are whole-heartedly in favor of enforcing the Volstead law. As a Southern quarry operator says: "Personally, we thoroughly object to ½ to 1 per cent alcohol; we would like it much higher; but as regards our business, we think it is a fine thing." But there are many who see otherwise. A few such opinions follow:

Prohibition has little or no effect on labor supply. When the country was wet, several laborers loafed in saloons until their money was spent. They loaf longer now because their money is not spent as rapidly as formerly. Married men and their families may be better off under prohibition but single men, as a whole, are not. Prohibition has nothing to do with the number of accidents to men at work. When the country was "wet", our men were sober, invariably, while on duty. We should have strict prohibition or the opposite—no "go between".

Prohibition has not affected the labor supply as far as we can observe but we are of the opinion that the quarry laborer who works hard 10 hours a day and perspires freely during warm weather, would do better work and be better satisfied with conditions if he was able to get light wines and beer. The foreign element apparently have been brought up so that they have learned to not abuse the use of light wines and beer and after they put in a hard day's work and drink such quantities of water they think there is nothing so satisfying as beer. We favor modification of the Volstead act, but not a return to the old methods of distribution.

We doubt if the prohibition act has caused anything more than unrest and poor supply of liquor. Labor probably would be better off to be permitted the purchase of wholesome liquor of not too great alcoholic content. We do, however, believe the abolition of the saloon to be a movement in the right direction.

We cannot say that prohibition has improved labor, which seems constantly dissatisfied, and the wage scale has to be constantly increased. Neither can we say that laborers and their families are now better off. Families help spend where heretofore the head of the families spent most of it, but the latter only in isolated cases. We do not favor strict enforcement of prohibition, for the reason that it does not prohibit. Drunkenness is an every-day occurrence, and more so among young people than during the time of the licensed saloon.

We can see no difference in the supply or quality of labor since the prohibition law became effective. Prohibition has not increased the efficiency of the common labor in this section. In some instances it is likely that the workmen and their families are enjoying more comforts, but in the South there is plenty of corn whisky to be had at reasonable prices and in the rural districts—where most of this moonshine is made—there is more whisky drunk now than before the Volstead act became effective. At our quarry accidents are no more numerous or no less than they were before prohibition. Personally, I am in favor of beer and light wines.

In reference to the effect of prohibition on the labor situation, we see very little, if any, difference among the foreign laborers. Most of the Italians make their own wine. We do find, however, that the American mechanic loses less time and works more steadily than before prohibition.

We believe that prohibition has certainly not increased the supply of labor and we are in considerable doubt as to its having made that labor which we do have more efficient than it was in pre-Volstead times. Our quarries are in more or less isolated locations and formerly we could at least be an influence as to whether or not licenses were granted for saloons in the proximity of our quarries. We have no such control at the present time. Illicit stills are unquestionably operated in all sections of the East and in some cases quite near to our quarries.

Those men who drank before are drinking now and I am sometimes inclined to feel that some men are now drinking who abstained previously. The liquor which they now absorb, and in perhaps somewhat larger quantities, is vile in character and more disastrous in effect on health and energy. We have taken some steps in certain cases to endeavor to have this illegal manufacture of alcoholic beverages suppressed, but without success in actually locating sources of supply and securing proper evidence. At times we have not had the energetic help of local authorities, who feel that they are not properly charged with the enforcement of the Volstead amendment. I do not mean to overemphasize this phase of the situation but merely mention it in order to show that it does not at all necessarily follow that prohibition has improved the labor situation at the quarries.

It is my firm belief that the prohibition question as it now stands is by far the most important single question governing the labor situation.

I am absolutely against whisky and brandy or such stronger liquors, only as the doctors would prescribe for a medicine, but you take a workingman who has been dissatisfied during the day, and if he should drink a glass of beer or two in the evening at home, would put him in a much better frame of mind.

I am not in favor of saloons as they existed before these laws of restriction were put into effect, but by allowing light wines and beer, I believe that more men would be willing to work and do better work, while they are on the job, which prevailed several years before the war.

It seems that the conditions are steadily getting worse, and it appears that a very large number either have some wine or other liquors of their own at home, that never thought of such a thing before prohibition went into effect, and the laboring men in general are all trying to get some "hootch" whenever possible, and when they do get this liquor, it is so very bad and they drink so much, not knowing when they will have another opportunity, that quite a number of our employes are off for several days at a time; while when it was legal to get something to drink, they would generally only take an average amount per day, knowing that they could get something the next day, and be in shape to work every day.

In my opinion, there is considerably more crime now than there has ever been, and it is doubtful whether we had so many people actually in need for a long time as we have right now.

The accidents at our plant have been more numerous since our men have been drinking "hootch" than ever before, and our records will show that, even though we use greater precautions from year to year under the inspection of insurance companies.

I am in favor of strongly enforcing prohibition as well as any other laws, as no nation, or business or corporation of any kind can exist unless there is some leadership, and the rules made by those in authority should be obeyed, until found not satisfactory, when there should be no hesitancy in either modifying or abolishing such rules altogether.

We should have a referendum vote, and each and everyone should be required to vote, and give his or her opinion either yes or no. I believe that light wine and beer would win by a heavy majority, and if such is the case prohibition should be repealed, as we would then save the enormous expense of trying to enforce the prohibition laws, and also receive enormous receipts for the licensing of light wines and beer, and in this way make the taxable burdens considerably lighter, and allow the people in general to purchase such moderate intoxicating drinks at a satisfactory price, where now the common people are paying exorbitant prices, and the only people who are reaping the big harvest are those engaged in the illegal traffic of liquors.

Regarding prohibition, we believe conditions are much worse than before the Volstead act went into effect. There is no question that there is plenty of moonshine always available. They now buy it by the quart instead of by the drink. Necessarily, they use more of it, are off the job longer, and are much harder to handle. We believe that there are more accidents now than before.

Keep in Personal Touch With Your Common Labor

J. L. Shiely, Contractor, Quarry Operator, and Sand and Gravel Producer, Says: "Insure Your 1923 Labor Supply by Treating Your Men Right"

J. L. SHIELY, president of the J. L. Shiely Co., St. Paul, Minn., who is a contractor, a quarry operator and a prominent sand and gravel producer, needs no introduction to ROCK PRODUCTS readers. His admirable summary of the present labor situation, and the manner in which he approaches it, deserves to be read and absorbed by every operator in the rock products industries. Mr. Shiely writes:

"Of course, restrictive immigration laws have tended to keep the wages of labor higher; naturally the supply of common labor is limited and any great prosperity will find a shortage of labor and naturally unsteady wage conditions.

"Personally, I am a great believer in giving to the man who makes your business his business something more than the so-called non-interested laborer whose only concern is the amount of his pay check.

"This company has for years given its steady common labor a high wage and percentage of profits as a reward for meritorious service. The percentage of profits distributed has averaged 10 per cent of the total amount earned by each man and is paid to him just before Christmas. In other words, a laborer who has earned $1,300 during the year will receive $130 for meritorious service. Our lowest wage paid for this class of steady labor has been 50 cents per hour This year common labor of the so-called floating class was plentiful at 35 cents per hour except during the harvest.

"Restrictive immigration laws will seriously affect our labor supply, for a generation of growth in this country needs a much greater labor supply than is naturally produced. The ambitions of our youths carry them away from a laborer's existence, and that is the rock upon which the labor supply is wrecked.

Encourage the Home Owners

"Business men should differentiate in the matter of wages between the laborer who builds himself a home, raises a family, educates them, pays his taxes, is a good citizen, and the so-called laborer whose only recommendation is a strong back and a weak mind. The latter class and his family ultimately become public charges and the expense of their existence is brought back home to the business men in the form of taxes and contributions to charitable organizations. I believe the latter class could be very materially reduced in numbers if we created an ambition within them to become members of the good citizen class.

"I personally, have seen too much exploitation of immigrants to want to do away with restrictive immigration laws. We should have them elastic enough, however, so that the actual needs of the country will be taken care of. I think the weakness of the general labor movement is that it does not differentiate between the responsible skilled workman and the irresponsible 'don't give a damn' kind.

J. L. Shiely, President
The J. L. Shiely Co.

Labor Not a Commodity

"New machinery is replacing quarry labor to a great degree. With the cost of the machinery and the supplies and repairs necessary to maintain, and with the increased wages for labor to operate, it has not made much difference in the cost of quarrying and crushing a yard of stone as compared with what it cost 10 years ago.

"A good business man is going to guarantee his labor supply from year to year under present conditions by keeping in touch personally with his employes. Labor has ceased to be a commodity that can be bought and paid for in money. Satisfactory labor can only be purchased by business men who consider the interests of their employes as essential to their success as their own family's welfare.

The Effect of Prohibition

"I never favored prohibition, though I was always opposed to saloons. There are so many good things and so many bad things developed since the advent of prohibition that makes it impossible to say what would be the best. We will always have bootleggers and moonshiners as long as we have prohibition. Beer and light wines without saloons means no reduction in bootleggers, but an improvement in the quality of legalized beer and light wines would, in my opinion, do away with the demand for poisonous intoxicants now sold by moonshiners.

"There is no question but what prohibition has relieved a great deal of misery—has made labor more efficient—but it needs tempering, for the pendulum swung just a little too far and caused a great deal of unrest. I, for one, would be willing to try out beer and light wines for home consumption under government control as an experiment. A problem can only be solved by trying it from different angles."

Universal Cement Co. Announces Price Reduction

THE Universal Portland Cement Co., of Chicago, announced a substantial reduction on December 28 in the prices of its cement. The reduction is 15 cents per barrel at its Chicago plant and 10 cents per barrel at its Pittsburgh and Duluth plants.

The Last Word in Sand Recovery

Plants of the Stewart Sand Co., Designed After Careful Laboratory Tests to Determine What Was Needed, Follow New Lines

INCREASING difficulties in obtaining a suitable quality and sufficient quantity of sand for Kansas City and the surrounding territory have resulted in a decided improvement in the recovery of washed sand.

The Kansas river, commonly known as the Kaw, has for years supplied this territory with sand, but growing demands coupled with increasing scarcity of supply have forced producers continually farther up the river until plants near the mouth, at the northern edge of Kansas City, are no longer operated and plants are distributed along the river from 6 to 12 miles from the mouth to the west of Kansas City. This gradual removal farther up the river has meant a stripping of the river itself, which became necessary as the supply of wash-in sand at the mouth became insufficient.

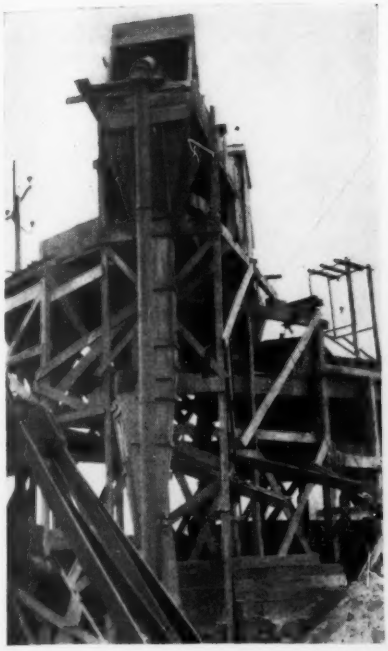
Under these new conditions the supply was scarcely adequate, either as to quantity or dependability. The bar sand available was in general too fine, and the problem was to classify this material so as to eliminate that which was too fine and produce a marketable material.

Another condition was that of occasional mud deposits which occurred during certain stages of the Missouri river when it backs up into the Kaw. The sand pumped at such times was somewhat muddy—not clean enough to pass as first-class material.

Both of these unfavorable conditions were met, and after several weeks of laboratory work plants were designed and constructed which produce clean, graded, high quality

A good view of the river equipment at Plant 6. At the right is the dredge; near the center is the 4-in. pump supplying "hydraulic water"; at the left is the small house containing the transformers

At Plant 6 hydraulic water used in sand tanks gives a better, cleaner product. The sand tanks are within the closed structure; to the left of it is the equalizing tank; the troughs on swinging arms load cars, trucks or storage; the portable loader handles sand from storage to trucks



The present wooden structure at No. 9 will be replaced by a steel one. This shows the sand and water discharging over the grizzly

sand in spite of the difficulties mentioned.

John Prince, president of the Stewart Sand Co., and Edmund Shaw, consulting engineer, are responsible for the design of these new plants. The result is the first application of hindered settling classifying to be made on a commercial scale in the recovery of sand. Not only is the fine sand and mud completely removed, but mud balls, sticks, leaves, and all sorts of trash are eliminated, leaving a clean and high quality product. In addition, the undesirable fine sand, after separation and washing, has found a market which takes it as fast as it can be produced.

This advance in washed sand recovery has been carried out at those plants of the Stewart Sand Co. which are located along the Kaw river. The first plant to be constructed and operated on this hindered settling principle is the one known as No. 6, at Mattoon, Kan., six miles from Kansas City, Mo.

A steel plant has been constructed here which can readily be dismantled and erected at a new location if the sand at this point should become insufficient. Within the steel framework, which is covered with corrugated iron, have been placed three Allen sand tanks, which accomplish the classifying.

Sand is pumped by a 10-in. manganese steel pump driven by a 300-hp. direct-connected motor. The vertical lift is 65 ft., and the sand and water discharge over a steel bar grizzly with 1½-in. spacing to reject any large material. A 5x9-ft. woven wire screen with rectangular openings ⅜ x ¾ in., rejects sticks and most of the refuse with the oversize material which may be pumped, and allow the sand and water to pass into three compartments, then by troughs into the three Allen sand tanks. The discharge valves can be so regulated as to obtain the proper grade of sand through them, while the overflow carries away the mud, silt, clay balls, and fine sand through a 12-in. iron waste pipe into the river below the plant.

In the hindered settling classification, "hydraulic water" is used to supplement the action of the ordinary rising current in the tanks in eliminating excessive mud, when the pump suction gets into the mud deposits. The term "hydraulic water" is used for clean water pumped from the river surface by a 4-in. pump into an equalizing tank on top of the plant and introduced into the bed of sand in the sand tanks whenever the sand pumped is muddy enough to require it. In practice this has been found to be at least half the time.

Inside the structure at No. 6—at the right are the pipes for clean water leading down into the three sand tanks

The auxiliary pump, driven by a 20-hp. motor, is on a barge at the edge of the river near the plant and delivers the clean water through a 5-in. pipe to the equalizing tank at the rate of 300 gal. a minute. This tank, 8 ft. in diameter and 4½ ft. high, is provided with an overflow which leads into the waste pipe so that when less than the full amount pumped is required the excess will flow back to the river.

A 4-in. pipe leads from this tank to each of the three cones and vertically into the cones to a horizontal cross pipe placed about one-third the height of the cones from the discharge valve at the bottom. This cross pipe is closed at the ends, and has several ¼-in. holes along the bottom, by means of which the hydraulic water is introduced into the sand. Valves regulate the flow of this water as desired.

Regulation of the flow of this water and of the rate of sand discharge makes it possible to eliminate in the overflow all the mud and the fine sand to any size desired.

Sand from the sand tanks falls to the storage pile directly below; or by means of long steel troughs, hung from swinging arms, sand passes either to the storage pile or directly to cars. An illustration shows how these swinging arms and suspended troughs operate. The ground area below and on either side of the plant has been floored with concrete to give open storage

A view of No. 6 from the river side of the plant, showing the box-enclosed grizzly, the screen box below the equalizing tank, and the feed pipe clear water pipe, and waste pipe

for from 3,000 to 4,000 tons. Storage directly upon the ground was found unsatisfactory because trucks had to get to nearly every point of the storage area, and the wet sand kept the ground too soft to make this possible without concrete flooring.

Because it is so close to Kansas City, Kans., this plant furnishes sand which is used largely by the trucking trade, and for loading trucks from storage the Link-Belt loader shown in the illustration is used.

Power for operating the plant is purchased at 6600 volts and transformed at the plant to 440 and 220 volts. The two pumps use power at 440 volts and the loader 220 volts. Five men operate the plant, two on the dredge, one on the plant, one on the cars, and one on the loader.

Saleable Fine Sand a Byproduct

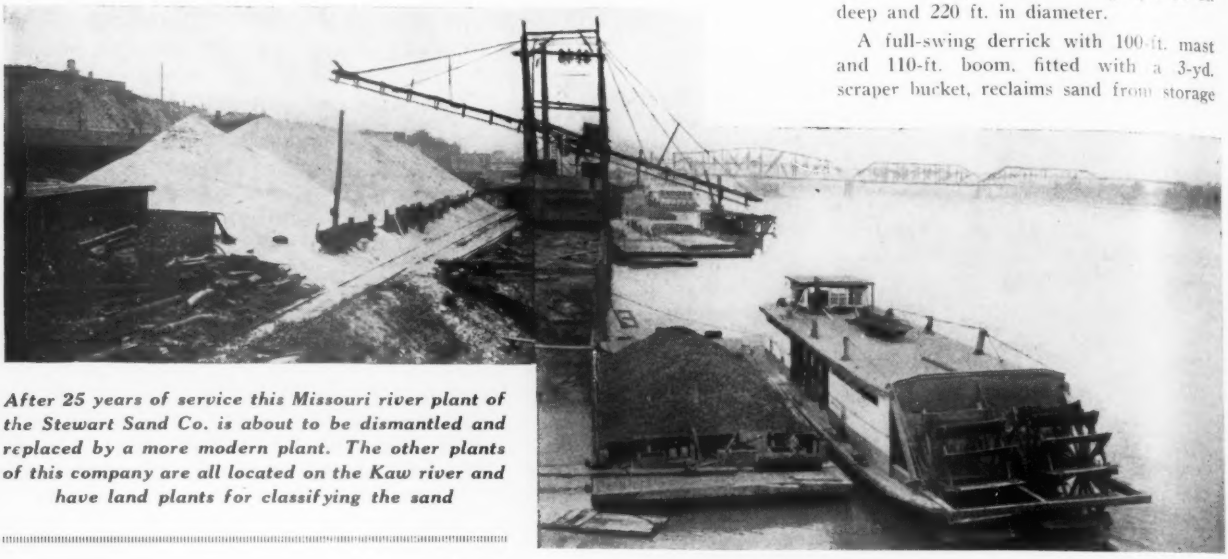
Similar in principles of operation to No. 6, plant No. 9 has some variations in methods of handling.

This plant is located six miles up the river from No. 6, and excessive quantities of fine sand have been one of the chief difficulties to be met at this plant. By the present arrangement this fine sand is separated from the coarser grade, washed, reclaimed, and sold at a good price.

The first improvement made at No. 9 was to divide the bin by partitions to make it a classifier. During the past year an Allen sand tank and two Dull cones have been added for the primary sand separation and the bin is now used for washing and classifying the fine sand. At the present time the plant is on a wooden structure, but a steel framework is to be erected during the winter, the old wooden bin discarded, and more cones added.

Beside the plant is a storage pit 30 ft. deep and 220 ft. in diameter.

A full-swing derrick with 100-ft. mast and 110-ft. boom, fitted with a 3-yd. scraper bucket, reclaims sand from storage



After 25 years of service this Missouri river plant of the Stewart Sand Co. is about to be dismantled and replaced by a more modern plant. The other plants of this company are all located on the Kaw river and have land plants for classifying the sand

A stiffleg derrick handles sand from storage pit to cars at Plant 9. Fine sand produced here which is not good for concrete finds a market for other uses

and loads it into cars. A three-drum Lidgerwood hoist driven by a 150-hp. motor operates the loading derrick, with a separate 30-hp. motor for swinging the arm.

Until the past summer the derrick was operated by steam, but electric power has replaced the boiler and engine formerly used. The cost will be less; power consumption will occur only at actual operating periods; there will be no need for the constant attention of a fireman; and fewer breakdowns will occur.

About half way between No. 6 and No. 9 is plant No. 8. At this plant there is in operation what is probably the first tipple in that section of the country designed and constructed to act as a classifier. This tank was designed by Mr. Prince to receive a certain quantity of feed and to produce a required grade of sand. A movable partition in the tank regulates the grade of sand produced when desired. The series of articles, "The Design of Sand Plants," now appearing in ROCK PRODUCTS, explains the principle on which this type of classifier is operated.

The fourth and last of the Stewart company's plants now in operation is on the Missouri river in Kansas City itself. Here there is no shore plant beyond what is necessary for unloading barges and for storage. A steam suction dredge operating in the Missouri river pumps the river sand to barges of 100-yd. capacity and the barges are towed in to the storage plant. Here a Hoover and Mason crane with a grab bucket, traveling on an incline, loads from the barges to cars or to the stockpile, or from the stockpile to cars. Storage of 15,000 tons is provided for, as shown in the illustration.

This plant has been in operation for a good many years. It is to be dismantled this winter and a more modern type of plant erected in its place.

Each of these plants has a capacity of from 800 to 1000 tons daily, and the average total daily output is from 2500 to 3000 tons.

Making Electrical Shot Firing Safe

Here are regulations passed governing the method of firing by electricity

WHEREVER it is feasible to adopt electrical shot firing for either mining or quarry work, this should be done as a safety measure. Electrical shot firing when properly carried out, eliminates some of the inherent dangers of fuse and squib firing.

Several states have already, by regulation or enactment, covered the question of electrical shot firing. The regulations of the states of California and New York, so far as they concern quarry blasting, are given by L. C. Isley, electrical engineer of the Bureau of Mines, in a bureau report of investigations and are reproduced below. This same report, serial No. 2405, publishes the regulations adopted by various states for tunnels, metal mines, and coal mines, and gives also the federal regulations for coal mines. Copies of the paper may be obtained from the Bureau of Mines, Washington, D. C.

Quarry Regulations for the State of California

California has the following rules covering electric shot firing, issued by the Industrial Accident Commission effective January 1, 1919:

Rule 629 (d). When electricity is used to fire shots, it shall not be permitted for any person knowingly to enter the vicinity of the place where such shots have been fired, until the cable from the source of electrical energy to the blasted holes shall have been disconnected and short circuited. It shall be the duty of the boss or shot firer to see that all such cables are disconnected immediately after such firing, and to examine or direct such examination of such place where shots have been fired before any men are permitted to work therein. Men must wait at least five minutes before returning to the point of blasting.

(e). It shall be the duty of the boss or shot firer to see that special precautions are taken against the shot firing cables or wires coming into contact with the lighting, power or other circuits, or with any metal pipe lines. All portable devices for generating or supplying electricity for shot firing shall be in charge of a boss or shot firer. No person other than a boss or shot firer shall connect the firing machine or battery to the shot firing leads, and such connection shall not be made until all other steps preparatory to the firing of a shot shall have been completed, and the men removed to a safe distance. Batteries used for shot firing shall be provided with a suitable case in which all contacts shall be made or broken, except that the binding posts for making connections to the firing leads may be outside.

(f). Electricity from light or power circuits shall not be used for firing shots, except where the electrical connections to such light or power circuits are made within an inclosed switch box, which shall be kept securely locked and shall be accessible only to the authorized boss or shot firer.

What New York's Department of Labor Rules Say

The Department of Labor, State of New York Industrial Commission, has issued the following rules relating to shot firing in quarries, effective July 1, 1918:

Rule 1106 (n). Firing shall be done by safety fuse or approved battery or from an electric current of not over 250 volts, provided a suitable switch is used, as hereinafter described. Other methods of firing may be permitted upon application and approval by the Industrial Commission.

(o). When firing by electricity from power or lighting wires in any quarry, a proper switch shall be furnished with lever down when "off." The switch shall be fixed in a locked box to which no person shall have access except the blaster. The lead wires shall be furnished with plugs and shall not be connected with the switch till ready to fire. After blasting, the switch lever shall be pulled out, the wires disconnected, and the box locked before any person shall be allowed to return, and shall remain so locked until again ready to blast.

(p). All power lines and electric light wires shall be disconnected at a point outside the blasting switch before explosives are taken in and loading of holes is proceeded with. No current by grounding of power or lighting wires or bonded rails shall be allowed beyond blasting switch after explosives are taken in preparatory to blasting, and under no circumstances shall grounded current be used for exploding blasts.

(q). The blaster shall cause a sufficient warning to be sounded and shall be responsible that all persons retreat to safe shelter before he sets off blast, and shall also see that none return until he reports it safe for them. He shall report to the quarry foreman and furnish names of all persons refusing to obey his caution. Suitable and convenient shelters shall be provided.

(r). When a blaster fires a round of holes, he shall count the number of shots exploding, except in case of instantaneous blasting by electricity. If there are any misfires he shall report the same to the gang boss or foreman. The blaster shall not leave until he has placed a wooden plug painted red, or other proper danger signal, in the mouth of the missed hole. If a missed hole has not been fired at the end of a shift, that fact, together with the position of the hole, shall be reported by the quarry foreman or shift boss to the quarry foreman or shift boss in charge of the next relay of quarrymen, before work is commenced by them.

(t). All wires in broken ore or rock shall be carefully traced and search made for unexploded cartridges.

(v). Blasters, when testing circuit through charged holes, shall use sufficient leading wires to be at a safe distance and shall use only approved types of galvanometers. No tests of circuits in charged holes shall be made until men are removed to safe distances.

Dry Batteries for Blasting

FOR small-scale blasting operations the National Carbon Co., Inc., is advocating the use of its Columbia dry batteries; for this purpose the new steel case hot shot battery has been developed. In its suggestions for the use of this battery for blast firing the company states that the blasting caps should be connected in parallel across the line instead of in series, as is customary with the generator method, says *Engineering News-Record*. A No. 6 dry cell will fire eight caps simultaneously.

For each 100 ft. of wire, counting both sides of the line, one dry battery in series should be added to the original cell. It is advisable from the safety standpoint to connect two ordinary push buttons, one on each side of the line, with the wires of the circuit. When ready to fire, both buttons are pressed at once.

Study of Costs by Associations Is Legitimate

TRADE associations or other groups interested in cost accounting may meet solely for the purpose of studying costs, detecting errors and improving methods without contravention of law, in the opinion of Commissioner Nelson B. Gaskill, of the Federal Trade Commission.

"Cost accounting is a legitimate trade association activity, and subsequent consideration has merely strengthened this conviction.

"Collective analytical study of the results of cost accounting furnishes an invaluable supplement to the individual cost accounting work. Comparison and analysis of results, and the study and general discussion of them, lead to the improvement of methods and thereby increase efficiency.

"To prohibit such activity is to shackle educative progress. Trade associations must therefore determine the legitimate field of proper endeavor and having so taken counsel, should, without hesitation, resting upon their legal advice and the clear consciousness of the propriety of their efforts, proceed without fear, willingly inviting the test of the courts' consideration of their conduct."

Indiana's Road School

THE program for the ninth annual road school, to be held at Purdue University, Lafayette, Ind., January 22 to 27, has been announced. On the program committee are C. C. Albright, professor, in charge highway engineering, Purdue University; Fred W. Connell, secretary, Indiana Crushed Stone Association, Indianapolis; J. J. Griffith, county surveyor, Indianapolis; A. H. Hinkle, chief engineer of maintenance, Indiana State Highway Commission, Indianapolis; and E. H. O'Neall, The W. Q. O'Neall Co., Crawfordsville.

The school is under direction of the school of civil engineering in co-operation with Indiana Highway Commission, the Indiana County Highway Superintendents' Association, the Indiana County Surveyors' and County Engineers' Association, and The City Street Commissioners' Association of the State of Indiana.

Among the papers to be read are: "Development of Local Deposits of Stone and Gravel for Road Use," by Highway Superintendent W. C. Jones; "Results of Bates' Road Tests," by Chief Engineer Clifford Older, Illinois Division of Highways; "Laboratory Tests of Road Materials" by R. B. Crepps, assistant professor of testing materials; "Payment and Accounting of Road Claims," by George M. Poland, auditor of Lake County.

"This is the big event of the year in Indiana," writes Secretary Connell, "and we have a state law compelling every county highway superintendent to attend. Few states have such an elaborate program as ours."

"Don't Get Hurt!"

HERE is a most practical and efficient way of putting over the daily warning to employes to avoid plant accident, recently inaugurated by the Rockland and Rockport Lime Corp.:

NEXT MONDAY MORNING

January 1, 1923, you will hear three short blasts of the whistle immediately following the regular 6:30 whistle. This will be repeated daily until further notice. It is what is called a code whistle, each blast representing a word. The first blast means "Don't," the second "get," and the third "hurt," so that altogether you get the sentence, "Don't get hurt." This is being done at the suggestion of the Safety department and its purpose is simply to remind you to be careful of your own safety and the safety of others for that day.

Sand Rates Protested

PROPOSED tariff charges, which, if upheld, it is feared, will seriously injure the glass industry in California and materially reduce the tonnage over Oakland docks, were protested recently by the Oakland Chamber of Commerce.

The charges provide for a payment of $4 a ton on Belgian silver sand, which prior to the adoption of the new tariff, has come in free. Approximately 25,000 tons a year of this sand is used in Oakland and an even greater amount is used in San Francisco.

A census of the glass industry shows that 1431 people are now engaged in it in this state and that the products of the glass factories are valued at more than $3,500,000 annually. Other firms also use sand.

University of Missouri Asks for Lower Agstone Rates

PROFESSORS M. F. Miller and P. F. Schowengerdt, of the College of Agriculture of the University of Missouri, on December 20 appeared before the Missouri Public Service Commission and presented arguments favoring a reduction of freight rates on crushed limestone to be used as soil fertilizer. The reduction is asked as a part of the college's three-year crop rotation program.

According to Messrs. Miller and Schowengerdt, the freight rates on lime fertilizers in Missouri are prohibitive and the farmers cannot afford to use them. It was pointed out that in Illinois last year more than 200,000 tons were used, while in Missouri, during the same period, only 18,000 tons were used.

Poland's Cement Industry

POLAND'S cement output in 1921, reports Trade Commissioner Allport, at Warsaw, exceeded that for 1920 by 40,402 metric tons, nothwithstanding the fact that two cement works in the eastern district, with a capacity of 270,000 tons, were not operating. A table giving the output of the producing regions, exclusive of Upper Silesia and of the Pomeranian factory at Wejherowo (data for which are not available), follows:

Region—	Output 1913	Output 1920	Output 1921	Capacity 1921
Congress	Tons	Tons	Tons	Tons
Poland	320,000	97,149	125,291	*537,000
Galicia	250,000	139,740	†152,000	444,000

*Another factory is in course of erection with a capacity of 90,000 tons.
†Approximate; taken as four times the output of the first three months.

The production per workman in Galicia is greater than that of Congress Poland. This is probably due to the more efficient factory organization in Galicia and to the plants' accessibility to the coal fields.

A Recent I. C. C. Decision

Sand Rates Unreasonable.—Applicable sixth class rates of 18 and 25 cents on molding sand, from Scale Siding, Pa., to Jersey City, applied between July 19 and October 19, 1920, were condemned as unreasonable, and reparation awarded in No. 12987, Barnes Foundry Co. vs. Central of New Jersey, opinion No. 7947, 73 I. C. C. 645-6. The Commission held them unreasonable to the extent they exceeded a commodity rate of 10 cents subsequently established and ordered reparation to that basis.

U. S. Court Decision Defines Trade Association Activities

Gypsum Industries Case Sets Precedent for Similar Trade Associations

HEREWITH is the complete text of the decision of the United States Court, District of Southern New York, in the now famous Gypsum Industries Association case. Editorial comment on this decision appears elsewhere in this issue. The text of the decision is as follows:

This cause came on to be heard at this term, and upon consideration thereof, and upon motion of the petitioner by William Hayward, United States Attorney for the Southern District of New York, for relief in accordance with the prayer of the petition, and no testimony or evidence having been taken, and all the defendants therein having appeared by their attorneys, Scott, Bancroft, Martin and MacLeish, Lyman M. Bass, Montague Lessler, George A. True, Roger I. Wykes and Frederick J. Powell and having consented thereto in open court; and upon the reading and filing of the petition herein, and upon the consent of the several defendants, and upon motion of the petitioner for relief in accordance with the prayer of the petition.

Now, therefore, it is ordered, adjudged and decreed as follows, viz.:

(1) That the combination and conspiracy in restraint of trade and commerce, the acts, regulations, rules, resolutions, agreements, contracts and understandings in restraint of trade and commerce and the restraint of such trade and commerce obtained thereby as complained of in this petition be declared illegal and in violation of the Act of Congress, approved July 2, 1890, entitled "An Act to Protect Trade and Commerce against Unlawful Restraints and Monopolies" and the acts amendatory thereof and supplemental or additional thereto.

(2) That the said defendants and their officers, agents, servants and employees and all persons acting under, through, by or in behalf of them or any of them, or claiming so to act, be and hereby are, ordered and directed to dissolve, and forever discontinue said Gypsum Industries Association and be and hereby are perpetually enjoined, restrained and prohibited directly or indirectly from engaging in or forming any like association or from making any express or implied agreement of association or arrangement similar to or like said agreement or arrangement the effect of which would be to restrain or monopolize said trade and commerce in gypsum products among the several states of the United States or in the District of Columbia, and from carrying out or continuing in effect the agreements described herein or making any express or implied agreements or arrangements together or with one another, like those hereby alleged to be illegal, or using any other means or methods the effect of which would be to prevent the free and unrestrained flow of such interstate trade and commerce in said gypsum products, or to monopolize the same. Provided however that the said defendants are not restrained or enjoined from jointly organizing and maintaining a corporation, the charter or articles of incorporation of which shall be expressly limited to the following defined objects and purposes or any of them:

(a) To advance or promote the use of gypsum products by research, publicity, advertisement and any other activities of like character.

(b) To deal with engineering and trade problems pertinent to the industry for the purpose of advancing the use of gypsum products.

(c) To carry on educational work pertinent to the industry by fellowships in various schools and colleges for research; experimental and research work in and through institutions of learning, scientific bureaus and societies; and to provide for lectures and the writing and reading of papers upon subjects pertaining to the industry.

(d) To maintain a traffic bureau to furnish traffic information upon specific request from published freight tariffs lawfully issued by the carriers, and to assist the industry in transportation questions before federal and state commissions and other bodies dealing with questions of transportation and with common carriers.

(e) To deal with improved methods of plant and mine operation including sanitation, safety appliances, accident prevention, labor, plant and mine development, housing conditions, insurance and methods of accounting.

(f) To maintain a credit bureau for the sole purpose of furnishing credit information.

(3) That the said defendants, their officers, agents, servants and employees and all persons acting under, through, by or in behalf of them or any of them, or claiming so to act, be perpetually enjoined, restrained and prohibited directly or indirectly from

(a) Agreeing to fix or establish by agreement among themselves the prices to be charged for said gypsum products.

(b) Agreeing among themselves in any manner whatsoever to charge purchasers of said gypsum products uniform prices or doing by agreement any act or acts which will result in maintaining uniform prices.

(c) Agreeing among themselves in any manner whatsoever to advance or decrease prices for their products to purchasers thereof.

(d) Agreeing among themselves in any manner whatsoever to advise or communicate with one another as to proposed advances or decreases in prices for their products to purchasers thereof or agreeing among themselves in any manner whatsoever to circulate among themselves in any way information concerning or relating to such proposed advances or decreases, or to the prices charged or to be charged.

(e) Doing any act or acts by agreement among themselves which will result in advising or communicating with one another as to proposed advances or decreases in prices for their products to purchasers thereof or in circulating by agreement among themselves information concerning or relating to such proposed advances or decreases.

(f) Agreeing among themselves in any manner whatsoever to limit, curtail, restrict or otherwise control the amount of said product to be produced for manufacture at any time by any or all of the defendants or by doing by agreement among themselves any act or acts which will limit, curtail, restrict or otherwise control the production or manufacture of said products by any or all of the said defendants, such as the withdrawal of salesmen from a certain territory over stipulated periods.

(g) Agreeing among themselves in any manner whatsoever as to the territory in which any or all of the defendants may sell or otherwise dispose of their products.

(h) Agreeing among themselves in any manner whatsoever to effect any discrimination of any character, whether in prices charged or otherwise in favor of or against any purchaser of their products by reason of the fact that such purchaser is a mail order house, purchasing agency, co-operative buying association or so-called "Dealer," or for any other reason or doing any act by agreement among themselves to effectuate any such discrimination in favor of or against any purchaser for any reason, except of course that each defendant may independently of the other defendants select his or its own trade and dispose of his or its products to such persons and on such terms as he or it may choose.

(i) Agreeing among themselves to use a published credit list and credit information for the purpose of blacklisting an undesirable purchaser or for the purpose of putting the name of the purchaser on such list with the intent of the manufacturer who submits the name reserving the purchaser's business for himself.

(j) Agreeing to fix, establish, or maintain by agreement among themselves the terms, differentials, discounts or prices which should be followed by a dealer, jobber, or other middleman upon his re-sale to a consumer or by any such agreement the uniform discounts which should be subtracted by each manufacturer, as an inducement for cash payment.

(k) Agreeing among themselves to adopt or follow any price list, published or compiled, or caused to be published or compiled by themselves or by any newspaper, trades paper or periodical as a fixed price.

(l) Agreeing among themselves to enforce any arbitrary freight rates in excess of those lawfully made.

(m) Agreeing among themselves that certain individual manufacturers engage in the manufacture of a certain gypsum product of a certain definite composition, and that all other manufacturers desist from manufacturing a product or such composition.

(n) Aiding or abetting or assisting individually or collectively others to do all or any of the matters herein set forth and enjoined and restrained herein.

(4) That nothing herein contained shall be construed to restrain or interfere with the action of any of the said defendants, acting with respect to his or its own corporate or individual business property or affairs, or furnishing necessary information to their own customers in connection with bona fide sales of such products, or individually doing any of said acts or things done in good faith to meet competition when such action or the furnishing of such information is not made or done in concert or as the result of any agreement among themselves, or to save any patent rights of any of said defendants; and that this decree and any of its provisions or the entry thereof shall be with prejudice to the rights or interest of any of the said defendants any proceedings which may be brought by or against them or any of them, except only any proceedings in this cause to enforce the terms of this decree.

(5) That jurisdiction of this cause be and hereby is retained for the purpose of enforcing this decree, and for the purpose of enabling any of the parties to apply to the court for modification hereof if it be shown to the satisfaction of the court, that by reason of changed conditions or changes in the statute law of the United States or in the interpretation of said law by the courts, or by reason of any new or different activities other than those hereby specifically authorized to be maintained and deemed necessary or desirable by the said defendants for the welfare of the gypsum industry or for any other reason, the provisions hereof have become inappropriate or unnecessary to maintain competitive conditions in interstate trade or commerce in gypsum products, or have become unduly oppressive to the defendants and no longer necessary to secure or maintain competitive conditions in such interstate trade.

(6) That the defendants Elbary Gypsum Co. and Colorado Portland Cement Co. not having consented to the foregoing decree, are, in consequence, not bound by its terms and provisions.

JNO. C. KNOX,
January 3, 1923. U. S. D. J.

National Agstone's Annual Meeting

PRESIDENT LAMKIN and the executive board have called the annual National Agstone convention for January 17 and 18, at the LaSalle Hotel, Chicago. The first session will be held on Wednesday afternoon immediately after the close of the National Crushed Stone convention.

Mr. Lamkin requests that all producers of agricultural limestone attending the crushed stone convention to meet and take part in the agstone convention. There will be a general discussion at the first session and the election of officers, adoption of a program and policy at the Thursday morning session. All producers not members of the association are invited to be present.

Bonner Cement Plant Sold

THE Bonner Portland Cement Co. plant, at Bonner Springs, Kans., the largest cement plant in northeastern Kansas, was sold on January 3 to Holger Struckman, president of the International Portland Cement Co., of New York, according to an official announcement. The consideration was declared to be $600,000.

The Bonner plant operates two kilns and has a daily output of 1500 bbl. The company uses the dry process, burning coal. It also has a power plant of 1400 hp. The former officers of the company were: Henry McGrew, president and general manager, Kansas City, Kans.; Philip Graff, vice-president and treasurer, Beatrice, Neb.; Harold Steeper, secretary, McLouth, Kans., and J. J. Adams, superintendent, Bonner Springs.

Enter Manganese and Chrome Steel Field

THE recent announcement of the Inland Engineering Co. of Chicago, concerning its entry into the manganese and chrome steel casting business, mentions that

Walter S. McKee, formerly vice-president and director of the American Manganese Steel Company, is president and treasurer of the new organization. His experience in the manganese steel business covers a period of 18 years.

Edward S. Black is vice-president, and is well known for his achievements in the designing of manganese and chrome steel castings for use in steel mills, ore docks and blast furnaces.

Eugene C. Bauer, vice-president, has had 16 years of sales experience in the manganese steel business, which includes a general knowledge of engineering and manufacturing.

J. W. Plant, also a vice-president, has devoted many years of his life to the manufacture and sale of carbon and manganese steel castings on the Pacific Coast.

With Alfred H. Exton as chief engineer and Claude Rorabeck as consulting engineer, the company is able to offer to its customers an excellent engineering service, combined with a thorough knowledge of steel foundry practice which only comes through years of untiring effort and experience.

American Industry Over-Equipped

A NATIONAL authority on costs, Arthur Lazarus, says that "Engineers claim American industry is 30 per cent over-equipped, which perhaps accounts for the fact that even concerns long established and with honorable records as dividend-payers are overhauling their cost methods, in preparation for the period ahead of super-competition. The cost charlatan has gone to the scrap pile, but there is a more than ever need for honest and competent cost service."

Indiana Sand and Gravel Men Arrange 1923 Schedule

A LARGE percentage of the membership of the Indiana Sand and Gravel Producers Association assembled at the Claypool hotel, Indianapolis, Ind., for its eighth annual convention on January 10 and 11.

The meeting opened with an address from President M. A. Neville, followed by a report of Jesse A. Shearer, treasurer. Mr. Shearer's report was gratifying to the members in that it showed the association to be in the best financial condition in its history.

R. C. Yeoman, secretary and engineer, made his report, abstracts of which follow:

"Your secretary has endeavored to take care of undertakings in the order of their seeming importance, but there has been much work that has of necessity been postponed until a more opportune time. Advice or criticism of his judgment, in order to insure proper correction and constructive future action, will be welcome.

"By the consistent co-operation of the members, the initiative, stability and constructiveness of the association are recognized and commended everywhere.

"The combined output of the association members in 1922 was a great increase over the 1921 output, and a greater increase may well be expected in 1923. This is certain, owing to the enormous building activities started in the latter part of last year."

Mr. Yeoman pointed out that through the association many freight rates had been adjusted for members, but that it was found that individual negotiations with railway officials would more successfully bring about approximate desired results. To aid members during the past year in obtaining adjustment of rates, Messrs. W. S. James, E. Guy Sutton and L. V. Hart were appointed as a committee to compile a book of freight rates suitable for Indiana and Illinois shippers. This committee was also called upon by the association to handle the car supply situation when it was at a crisis. Through it the association petitioned the Interstate Commerce Commission for modification of Service Order No. 23, and later the committee assisted the national association in a car supply hearing at Washington on September 21. The results of the petition and hearing were tangible to the extent of securing the issuance of Order No. 25, permitting the loading of cars in the direction of the mines.

Mr. Yeoman also enumerated the accomplishments of the association through meetings and general co-operation with other associations and societies. In addition to this he told of tests made with agricultural sand and the success of tests made with various types of road rollers and impact machines. A review of the work done in the laboratory showed that it had been conducted practically in the same way as in 1921, with the exception of the drawing up of a diagram for reporting screen analysis on any size of sieve. This diagram was published in ROCK PRODUCTS and received much favorable comment.

Mr. Yeoman concluded his report by offering the following recommendations:

"First, that a freight rate and car supply policy be definitely outlined for the guidance of the secretary.

"Second, that a vigorous advertising and educational campaign be launched to promote the use of sand and gravel, and that a committee of three be appointed to assist in working out the details.

"Third, that continued attention be given to the needs of members in the Wabash Valley who ship into Illinois, by promoting better relations and the use of sand and gravel in Illinois with the highway commission of that state.

"Fourth, that an exhibit be designed to show the value of clean and screened sand and gravel for use on gravel and hard surface roads and buildings.

"Fifth, that a contractors' estimating service be provided at the association's office, where plans and specifications may be collected and quantities figured.

"Sixth, that a new map be made, showing the location of plants, and on which the membership of the association be well advertised.

"Seventh, that the association co-operate with the American Society for Testing Materials, the American Concrete Institute, the Purdue Road School, and state associations of County Surveyors, Road Superintendents and Commissioners.

"Eighth, that a freight rate book be compiled showing all shipping and delivery points used by members.

"Ninth, that a program be designed to preserve and strengthen the friendly relations between members and that a feeling of good fellowship be continually encouraged.

"Tenth, that a special committee again visit those qualified producers who are not members and seek their co-operation."

During the past year the association had retained the services of Ralston, Gates, Lairy, Van Nuys and Barnard, a law firm of state-wide reputation, for the purpose of learning the rights of an association or individuals in connection with the issuance of priority orders by the Interstate Commerce Commission. A very complete analysis and explanation of this subject was given by G. M. Barnard of the above firm in which he made clear to the members present, their rights as producers and advised them relative to the necessary action to take in the event of future priorities. An unrestricted discussion followed Mr. Barnard's address during which the members asked many questions, all of which were ably answered by Mr. Barnard. Judge M. B. Lairy and E. E. Gates of the firm, supplemented Mr. Barnard's statements. The discussion ended leaving the members confident that car troubles in the future would never have the serious effect on them as encountered during 1922. It was suggested by Mr. Barnard that the most necessary evidence in a case would be records of cars asked for and cars received, and he pointed out that many railroads have reported companies as having received a 100 per cent car supply when in reality such companies had experienced a 100 per cent shortage. This was explained by Mr. Sutton, who said that some companies, during the car shortage, realizing they could not get cars, did not ask for them. The result was that they were entered on the railroads' records as having received a 100 per cent supply. By keeping a record this ridiculous misunderstanding would be eliminated in the future.

The Allied Motor Commerce was represented at the meeting by Secretary S. C. Hadden, who gave an interesting talk in which he told of the activities of his organization during the past year and of the proposed legislation it hopes to bring about. He stated that Indiana has over $6,000,000 to its credit at Washington for Federal-aid roads and that unless some sort of a new tax is assessed, this money would never be used. Mr. Hadden explained that the Motor Vehicle Tax bill, which is to be introduced this year, provides for a tax of 2 cents per gallon on gasoline, to be paid by the consumer. Such a tax would mean an additional income of approximately $5,000,000 for the state which would be spent on improved highways. The association assured Mr. Hadden of its support and co-operation in putting the bill through.

"Advertising Raw Products" was the subject of an address by H. Colin Campbell, advertising manager of the Portland Cement Association. Although Mr. Campbell did not divulge all of his methods used in his many successful advertising campaigns, he did point out to the association the necessary factors and principles of successful advertising.

The Illinois State Highway Commission was represented by Fred Burggraf, assistant engineer of tests, who gave a thorough explanation and description of the methods employed in his department,

enumerating the volumes of the different materials tested during the past year. Mr. Burggraf, using a chart to illustrate, explained the new specifications of his state to the satisfaction of the members present. He also brought to their attention the efforts of Secretary Yeoman in trying to get changes in the Illinois specifications for the benefit of association members in the Wabash Valley.

A business meeting for members only followed Mr. Burggraf's paper.

At this meeting the following officers were elected: A. N. Brown, president; L. R. Witty, vice-president; J. A. Shearer, secretary-treasurer; and J. P. Coyle, E. S. Baker and Abe Hart as directors.

Chief among the recommendations offered and adopted were the following:

"First, that the tonnage assessment on all classes of sand and gravel be reduced 50 per cent; that the maximum dues be reduced 50 per cent and that the minimum dues be left as at present.

"Second, that no changes be made in the organization as it exists, and that the activities be continued as in the past, under the direction of the executive committee.

"Third, that each member consider himself a committee of one to add a new member."

A fourth recommendation covering the matter of a budget was adopted. This recommendation was provided with estimated amounts necessary to carry on the different branches of the work for the next year.

A. H. Hinkle, superintendent of maintenance of the Indiana State Highway Commission, told the association how it could assist the commission in building roads more economically and efficiently.

Other speakers at the meetings were: Frank L. Catt, County Engineers' Association, Rushville, Ind.; Clyde Piper, Highway Superintendents' Association, Connersville, Ind.; Perry H. Easton, state senator, Sandborn, Ind.; William J. Titus, engineer of bridges, Indianapolis and W. M. Holland, Portland Cement Association, Chicago.

The attendance, which was unusually representative of the territory covered by the association, was as follows: W. S. Baird, Mt. Carmel Sand and Gravel Co., Mt. Carmel, Ill.; Charles Jump and D. B. McCown, Noblesville Sand and Gravel Co., Noblesville, Ind; E. L. Shaneberger, Macksville Gravel Co., Terre Haute, Ind.; E. A. Neville and C. F. Neville, Western Indiana Gravel Co., Terre Haute, Ind.; L. F. Hart, Wabash Sand and Gravel Co., Terre Haute, Ind.; H. L. McGurk, Montezuma Gravel Co., Terre Haute, Ind.; G. V. Miller, W. K. Miller and G. H. Stilz, Granite Sand and Gravel Co., Indianapolis, Ind.; J. A. Shearer, F. J. Billeter and A. G. Wilson, Indiana Gravel Co., Indianapolis, Ind.; H. E. Neal and J. P. Cantlon, Neal Gravel Co., Mattoon, Ill.; E. Guy Sutton, W. P. Carmichael and F. P. Steinberg, Carmichael Gravel Co., Danville, Ill.; John Kuert and R. F. Higbee, Wabee Gravel Co., Millford, Ind.; George J. Hoffman, Geo. J. Hoffman Co., South Bend, Ind.; Harry Brymer, James Edwards, J. C. Oliver and M. K. Morgan, Standard Sand and Gravel Co., Clinton, Ind.; Abe Hart and D. R. Snyder, Abe Hart Co., Sandborn, Ind.; D. V. Yeoman, Columbus Gravel Co., Columbus, Ind.; E. S. Baker, Baker Gravel Co., Noblesville, Ind.; A. G. Young, Covington Sand and Gravel Co., Covington, Ind.; A. M. DeHaven, Interstate Sand and Gravel Co., Terre Haute, Ind.; A. M. Brown, Brown-Huffstetter Sand Co., Indianapolis, Ind.

Special guests were as follows: L. F. Wertz and P. D. Meisenhelder, State Highway Department, Indianapolis; C. M. Young, Cincinnati Rubber Mfg. Co., Cincinnati, Ohio; C. D. Franks, Portland Cement Association; D. H. Fatout, Indianapolis and George M. Earnshaw, associate editor, Rock Products, Chicago.

Iowa Producers Hold Meeting

BUSINESS for 1922 was not good for Iowa sand and gravel producers taken as a whole. This was brought out at the annual meeting of the Iowa Sand and Gravel Producers' Association held in Des Moines, January 11. A few producers experienced satisfactory seasons, but even for these producers the car shortage during the summer and fall cut down to a large extent the amount of business which could have been accomplished under favorable conditions. Other producers suffered from the inability of farmers to make the customary amount of repairs and extensions to their property. The demand from farmers for sand and gravel distributed through local building material dealers forms a considerable portion of the business of many producers, and since this business amounted to practically nothing during 1922 the total sales dropped materially. Retail business in Des Moines was excellent, and in part compensated the loss of the farmer business for those producers located in Des Moines.

For 1923 producers were practically unanimous in their predictions of better business, though there are still factors too uncertain to make any definite estimates. The highway program for the year is to be determined by the legislature which has just convened, and the attitude of the legislators toward additional taxation for extended highway construction is doubtful. In spite of this and one or two other uncertain conditions, however, producers look to 1923 to be much better than 1922 has been. In some sections, it is true, it would take but little business to make 1923 better than 1922.

The association took a new lease on life at its meeting. The meeting opened with a considerable deficit showing on the books, which was more than offset by the total amount of unpaid dues for the year. Assessments on the various companies were scaled down to 75 per cent of the original amount, and checks totaling nearly $1000 were paid in during the meeting, enough to meet outstanding obligations and start the new year with a clean slate.

During the past year the association has employed a salaried secretary for the first time in its history. A number of members did not find the additional expense justified, and it was voted to discontinue both the paid secretary and the tonnage basis of assessment. Dues for 1923 were set at $25 for each member company, payable in advance, and membership in the national association was made optional with the individual members.

Prospects for an increase in the membership of 24 during 1922 are good. Twenty producers represented at the meeting came in promptly for 1923, and a number not represented are counted on for 1923 membership.

The subjects of credits and collections and operating costs were discussed. R. C. Fletcher, of the Flint Crushed Gravel Co., pointed to a record of 100,000 tons of material shipped during the season and accounts receivable of less than $300 on the company's books at the present time.

Officers elected for the coming year are J. W. Pichner, of the King's Crown Plaster Co., Cedar Rapids, president; E. A. Lansrud, of the Independent Sand and Gravel Co., Des Moines, vice-president; H. D. Bellamy, of the Iowa Sand and Gravel Co., Oskaloosa, secretary. The following committee chairmen were named R. Snoddy, of the Coon River Sand and Gravel Co., Des Moines, membership; R. C. Fletcher, of the Flint Crushed Gravel Co., Des Moines, transportation and legislative committees; E. A. Lowderbaugh, of the Northwestern Gravel Co., Des Moines, specifications.

R. C. Fletcher, who retires from the presidency of the association after several years of active and valuable service in that position, strongly recommended the support of individual members for the National Sand and Gravel Association. Several other members testified to benefits, both direct and indirect, derived from national association membership.

Traffic and Transportation

By EDWIN BROOKER
Munsey Building, Washington, D. C.

To Investigate Adequacy of Railroad Equipment

THE Interstate Commerce Commission has ordered an investigation into and concerning the adequacy of the locomotives and cars of all descriptions owned and used by all common carriers in the transportation of freight between points in the United States, and into and concerning the customs and practices prevailing or desirable with respect to the ownership, use and interchange of cars, with a view to promoting economical and efficient service, to prescribing and establishing such just and reasonable rules, regulations and practices with respect to car service, and to require the carriers to provide themselves with such safe and adequate locomotives and cars wherewith to perform as common carriers their car service as may upon such investigation appear to be contemplated and required by law.

The carriers are requested and required to furnish the Commission with information called for in appendices attached to the order not later than February 1, 1923.

Included in appendix A the Commission asks for full information regarding the total number of coal cars which were available for service at the beginning of the year 1922; the number installed during the year and the number ordered but not delivered.

Appendix B requests information of the number of additional cars of each class, including coal cars, and the estimated cost thereof, necessary to meet requirements of Interstate Commerce Act.

Appendices C to F seek information as to the age of freight cars, of 100,000 lb. capacity and over; 80,000 lb. and less than 100,000; 60,000 lb. and less than 80,000 lb., and 60,000 lb. and less, respectively.

Appendix K requests information of the number of loaded cars of freight handled by months for the year 1922. The different classification of commodities are shown and clay, sand, gravel and stone are listed as one separate item. Cement is shown as a separate item and lime and plaster as another.

In Appendix M the Commission asks for the average number of box, furniture and automobile cars and the average number of gondola, coal and coke cars on each railroad daily.

Appendix P requests information of the freight car surpluses by months, showing the daily averages for each month of the various classes of cars.

Appendix Q requests information of the freight car shortages in the same manner.

In the above analysis of the information, only the item covering open-top cars has been shown and the balance of the appendices relate to locomotives and private and other types of cars.

The Commission announces that this proceeding, known as Docket No. 14489 will be assigned for hearing at such times and places as the Commission may hereafter direct.

We understand, in connection with this matter, that shippers will be given the opportunity of submitting information concerning service and the effect of the shortage of transportation facilities on the movement of traffic.

A problem which the Commission must consider is the normal requirements of cars as compared with the serious shortages of equipment during times of emergency, such as was occasioned during the year 1922 as a result of the coal and the shopmen's strike. While normally, some improvement is necessary in the facilities offered, it is the abnormal demand for cars in which to transport coal, following tie-ups in the coal and transportation industries, that affects the construction industry.

Is there not an opportunity confronting producers and contractors alike, to show the effect of the recent car shortage on their business and to bring out fully the losses sustained in the building industry, as a result of the inadequacies of both freight cars and locomotives? If it were possible to collect the necessary statistics from a sufficient number of producers and contractors, we believe, if the data was introduced as evidence in this proceeding, that both the railroads and the authorities would be surprised at the results and that some action would be taken to prevent future tie-ups in the building industry, on account of lack of transportation facilities.

Carriers Not Permitted to Cancel Combination Rule

RAILROADS in Southwestern states, by schedules filed with the Commission to become effective on August 10, 1922, attempted to eliminate the so-called combination rule, in tariffs applying in that territory. Shippers protested and the Commission suspended the effective date of these tariffs, pending investigation and hearing under I and S Docket No. 1617.

The combination rule provides that where no published through rates are in effect from point of origin to destination on certain specified commodities, and there are in effect separately established rates to and from junction points, the through rate for continuous rail shipments will be arrived at by deducting specific amounts from each separately established rate factor, and by adding a specific amount to the sum of the factors thus obtained. The necessity for the original establishment of the rule, was the specific increases made in the rates per 100 lb. or per ton during June, 1918, by order of the Director General, and so as to provide not more than one increase on shipments moving under a combination of local rates. The original amounts to be deducted and added were changed during August 1920, when the Commission authorized further increases in the rates under ExParte 74.

The rule today on sand, gravel and crushed stone, provides that an arbitrary of 30 cents per ton will be deducted from each of the local rates to and from junction points on a through shipment, the factors thus obtained added together and an arbitrary of 30 cents added to such result.

This rule has been the source of considerable difficulty and annoyance to railroads and the shipping public alike. It has resulted in the filing of several million dollars worth of claims against the railroads, on account of misinterpretation and misapplication. The railroads are desirous of getting rid of this rule and they had a conference with the Commission during the latter part of 1920 and secured the approval of the Commission to cancel the rule, provided that prior thereto, the railroads would publish through rates on the commodities affected thereby or publish proportional rates to and from junction points, so as to make the through charges not higher than those obtained by use of the combination rule. Such rates will be published to cover all cases where there is a substantial movement of traffic. Since the time of the conference the railroads have intermittently published a notice to shippers by a supplement to the tariff naming this rule of their intention to cancel the same and their willingness to publish through rates.

The protest of the shippers in I and S docket No. 1617 included rates on sand and gravel from La Grange, Saulsbury and Camden, Tenn., and pits on the Southern Railway near Iuka, Miss., to

points in Arkansas bases on a combination to and from Memphis, Tenn. Shippers had made a general request of the carriers to publish through rates and the carriers had requested to furnish information as to the volume of movement, which shippers were unable to furnish. No provision was made for the continuation of through rates in line with the railroads' announcement and after schedules were filed cancelling this rule, shippers asked for their suspension.

The Commission in its decision and order in this case, said as follows:

"We are not disposed to approve retention of the combination rule because there is an indefinite possibility that future shipments may be affected by its cancellation. On the other hand, respondents have knowledge of actual movement or of traffic or transportation conditions which sometimes make a future movement reasonably certain. Even though the combination rule may be undesirable as a tariff rule, that fact alone does not justify its elimination from the tariffs unless the carriers publish either joint or proportional rates in lieu thereof, in order to prevent unwarranted increases in rates."

The Commission issued an order directing the railroads to cancel the tariffs.

By this action it does not mean that the tariffs now providing for the combination rule will remain in effect indefinitely. Shippers are solicited to request the publication of through rates or proportional rates, which will result in a continuation of the present basis. Those that have shipments moving under a combination of local rates, should request their railroad to publish such rates. If they do not do this, and the railroads take action eliminating this rule, and shippers find their rates increased 30 cents per ton, it is not likely that the Commission will recognize protests, after ignoring the carriers' invitation to notify them of instances where there are substantial movements.

The great difficulty which confronts producers of sand, gravel and crushed stone in this matter, is the fact that it is impossible to foresee probable movements in the future to the most obscure markets where no materials have moved in the past and which markets may become the centers of large movements of materials due to the building of good roads in those vicinities. It therefore seems advisable for shippers, in order to protect themselves, to make a general request upon the railroads for publications of either through or proportional rates, to take care of traffic to all points possible to reach from their plants.

THIS IS CONVENTION MONTH—National Crushed Stone Association in Chicago January 15, 16 and 17; National Sand and Gravel Association in Washington, January 24, 25 and 26; National Slate Association in New York, January 22 and 23.

Proposed Changes in Freight Rates

Central Freight Association

No. 5705. Sand (blast, engine, foundry, glass, moulding and sand ground from silica or pebble rock)—Emlenton, Pa., to Ambridge, Pa. Present sixth class. Proposed $1.53 per net ton.

No. 5714. Lime—Proposed advances and reductions in rates from Northern and Western Ohio points to Ansonia, Celina, Chillicothe, Circleville, Coalton, Coldwater, Coshocton, Delphos, Dresden, Dundas, Fostoria, Dallipolis, Jackson, Lancaster, Lima, Mansfield, Middleport, Midland City, Mt. Vernon, Newark, New Comerstown, Orrville, Piqua, Pomeroy, Sidney, and Wellston, Ohio. The rates from Marblehead, Tiffin, Toledo, Gibsonburg, Luckey, Woodville, Carey, McVittey, Marion, White Sulphur, etc., Ohio to Coshocton, Ohio, will be increased from 10 cents to 12½ cents per 100 lb. Other changes are reductions.

No. 5724. Sand and Gravel—Bainbridge, Coalton, Cornelia, Cove, Glade, Glen Jean, Jackson, Lincoln, Ratchford, Waverly and Wellston, Ohio, to Hillsboro, Ohio. Present sixth class. Proposed $1.40 per ton in open-top cars; $1.61 per ton in closed cars.

No. 5746. Sand and Gravel—Via C. & E. I. from Terre Haute and Summit Grove, Ind., to Benton, West Frankfort, Johnston City and Marion, Ill. Present 112 cents. Proposed 126 cents per ton. Via Penna, St. Elmo, C. & E. I. from Terre Haute and Macksville, Ind., to Benton, West Frankfort, Johnston City, Ill. Present 112 cents. Proposed 126 cents per ton. Via Big Four Shelbyville, C. & E. I. from Terre Haute, Ind., to Benton, West Frankfort, Johnston City and Marion, Ill. Present 112 cents. Proposed 126 cents per ton.

No. 5750. Lime—Milltown and Marengo, Ind., to McLeansboro, Ill. Present class basis. Proposed 16 cents per 100 lb.

No. 5754. Crushed Stone and Crushed Stone Screenings—Marblehead, Ohio, to Fairmont, W. Va., and points taking same rates. Present no through rates in effect. Proposed $2.25 per ton.

No. 5755. Crushed Stone—France Quarries, Ohio, to Lagonda, Thorps, Royal, South Charleston, South Solon, Blessings, Jeffersonville, Parrots, Heglers, and Washington C. H., Ohio. Present sixth class. Proposed 90 cents per ton.

New England Freight Association

No. 4016. Lime (minimum weight 50,000 lb.)—From Brunswick, Me., to Newark, N. J., 22 cents per 100 lb. Reason: to enable shippers to compete with those on Central Vermont Ry. at Swanton, Vt.

No. 4037. Sand—N. O. I. B. N. minimum weight capacity of car—Bellefont, R. I., to Biddleford, Me. Proposed $2.85 per gross ton.

No. 3157. Lime (minimum weight 50,000 lb.)—Various N. Y., N. H. & H. Ry. shipping stations, to various points in Trunk Line territory. Reason: To establish commodity rates to these points comparable with other points in the same district.

Southern Freight Association

No. 8455. Cement—Fordwick, Va., to East Carolina Ry. stations. It is proposed to reduce the present rates so as to reflect the same differentials over the rates to Farmville and Tarboro, N. C., as are at present reflected in the rates from Kingsport, Tenn., in accordance with general basis for rates to Carolina Territory, holding as maxima, combination rates based on Farmville and Tarboro, N. C. subject to the use of Agent Kelly's Tariff 228.

No. 8460. Cement—Sellersburg, Ind., to Rogersville, Tenn. Present 27½ cents. Proposed 26 cents per 100 lb. which is made on basis of Knoxville combination in connection with Agent Kelly's Combination Tariff.

No. 8471. Cement—Charleston, S. C., to points in North Carolina shown in Agent Glenn's I. C. C. No. A271. Present rates are as shown in tariff named. It is proposed to establish rates in line (distance considered), with rates from Norfolk, Va. Following are rates to representative points: Rocky Mount, Washington, Wilson, Kinston, Goldsboro, Durham, Fayetteville, Charlotte and Winston-Salem, N. C., 19 cents; Pembroke, Maxton, Chadburn and Wilmington, N. C., 18 cents per 100 lb.

No. 8475. Gravel (for road making purposes)—Minimum weight marked capacity of car, from Sulligent, Ala., to Jasper, Cordova, Dora and Summit, Ala. on basis of 68 cents to Jasper, 78 cents to Cordova and 82 cents per net ton to Dora and Summit, Ala.

No. 8483. Cement—Richard City, Tenn., to Statesville. Present 24 cents. Proposed 25 cents; to Southern Ry., Taylorsville Branch stations. Present 21½ cents. Proposed 25 cents per 100 lb. (These being the same rates as from Birmingham and Leeds, Ala.)

No. 8492. Cement—Kosmosdale, Ky., to C. N. O. & T. P. stations north of Georgetown to and including Elsmere, Ky. Present lowest combination applies. Proposed 15½ cents per 100 lb.

No. 8499. Cement—Rockmart, Ga., to L. & N. stations between Mobile, Ala., and New Orleans, La., on same basis as in effect from Richard City, Tenn.

Southwestern Freight Bureau

No. 7206. Lime—To revise rates on lime from Ash Grove, Springfield and Joplin, Mo., and points grouped therewith, to Texarkana, Ark-Tex., and Shreveport, La., so as not to be lower than from Texas producing points. It is claimed that the average distances are somewhat greater than from Texas producing points and that rates from Missouri producing points should not be lower than from Texas points.

No. 7216. Cement—To revise the minimum weight on cement from interstate points to points in Oklahoma, to 50,000 lb., where it is now less. It is claimed that proposed minimum weight is in effect generally between points in Oklahoma, also in Western Trunk Line territory and should also be the minimum weight from interstate points to Oklahoma points in the interest of uniformity.

No. 7234. Sand, Gravel, etc.—Richard Spur, Okla., to Burkburnett, Texas, 5 cents; to Electra, Texas, 7 cents; to Vernon, Texas, 6½ cents and to Wichita Falls, Texas, 5½ cents per 100 lb. Shippers claim proposed rates are necessary to meet competition of shippers located at Chico and Bridgeport, Texas.

No. 7258. Lime—Mosher and Ste. Genevieve, Mo., to points in Arkansas, same rates as at present in effect from Ash Grove, Mo. It is claimed by shippers that inasmuch as the distance from the Ash Grove district to points in Arkansas is generally greater than from Mosher and Ste. Genevieve, the Ash Grove rates being lower, should apply.

No. 7259. Sand, Gravel and Crushed Stone—Louisiana producing points on the G. C. & S. F. Ry., to points in Texas on the T. & Ft. S. Ry. and O. & N. W. R. R. rates per 100 lb. as follow:

To	Proposed Cents
Ruliff	6
Hartsburg	6
Lemonville	6
Mauriceville	6
Doty	6
Lynn	6
Vidor	6
Schneider	6
Beaumont	6
Chaison	6
Security Oil Spur	6
South Beaumont	6
Bartholamu Spur	6
Higgins	6½
Garrison Siding	6½
Spindle Top	6½
McFadden Spur	6½
Sun	6½
Magpetco	6½
Nederland	6½
Rice Farm	6½
Neches Jct.	6½
Port Neches	6½
Griffling	6½
Port Arthur	6½
West Port Arthur	6½

To Orange, Texas, and intermediate points on the O. & N. W. Railroad, proposed rate 7 cents per 100 lb.

No. 7260. Lime—Texas producing points and Ruddels, Ark., to Elizabeth, La., 22½ cents per 100 lb. It is claimed that a paper mill is under construction at this point which will use considerable quantities of lime, but that the present rate is too high to enable them to secure this lime from Texas kilns and from Ruddels, Ark.

Trunk Line Association

No. 10901. Cement—Fordwick, Va., to Harrisonburg, C. W. Ry. Jct., Pleasant Valley, Showalter, Mt. Crawford, Bluffs, Cave Station, Mt. Sidney, Fort Defiance, Bowling and Verona, Va., 10 cents per 100 lb.

No. 20924. Cement — To establish basis of rates from Trunk Line producing points to Ravenswood, Spencer and Glenville Branch of the B. & O. railroad at 5 cents per 100 lb. over the rate applying to Ravenswood, W. Va., and also to Ripley Branch stations on the B. & O. on basis of 5 cents per 100 lb. over rates to Millwood, W. Va.

Western Trunk Line Committee

No. 2457. Lime—Marblehead, Quincy, Hannibal, St. Louis and Mississippi River lime kilns to Omaha, Lincoln and Crete, Neb., is withdrawn.

Dismiss Central Rate Case

By Edwin Brooker

IN the hearing before the Interstate Commerce Commission on sand and gravel rates in the central territory the rates, considered as a whole, were found by the commission to be not unreasonable, unduly prejudicial, or otherwise unwalful, and the complaint of the National Sand and Gravel Association was therefore dismissed. The case was submitted May 22, 1922, and decided December 11, 1922. Following is the text of the decision which has just been made public:

Exceptions were filed by complainants to the report proposed by the examiner, and the case was orally argued.

This complaint was filed October 21, 1921, by an association of producers of sand and gravel engaged in business in all sections of the United States, for the purpose of securing a general reduction in rates on sand and gravel, interstate and intrastate, in Wisconsin, Illinois, Indiana, Ohio, Michigan, Western Pennsylvania, and Western New York. The complaint was afterward amended to include rates on crushed stone in the same territory, but the evidence relates almost entirely to sand and gravel. At the hearing the complaint was withdrawn as to rates in Wisconsin and Northern Illinois. Rates will be stated in amounts per net ton and do not reflect the general reduction of July 1, 1922.

It is alleged in the complaint that the general level of rates on sand and gravel in central territory is unreasonably high, preventing a normal movement of those materials, and thereby retarding construction of roads and buildings and contributing to unemployment, and that the high level of rates results in a diminution of traffic, hindering defendants from earning the fair return on the value of their property contemplated in Section 15a of the Interstate Commerce Act. Complainants also charge undue prejudice due to the fact that in some instances rates on sand and gravel are on a higher basis than those on slag, a competing commodity. The prayer is for a general reduction of rates on sand and gravel to amounts exceeding the rates in effect on June 24, 1918, by not more than 10 cents per ton. The same request was made by sand and gravel producers in *Reduced Rates*, 1922, 68 I. C. C., 676, hearings in which were in progress when the instant case was heard, and complainants refer to this proceeding as a "magnified section" of our general investigation covered by the report above cited.

Complainants urge that the increases in rates on sand and gravel in the last five years have been excessive in comparison with those on other commodities, largely because of the flat increase of 20 cents per ton imposed by General Order No. 28. As in *Reduced Rates*, 1922, *supra*, it was testified that these increases have diverted business from the larger pits, which have heretofore enjoyed a wide range of distribution because of favorable rates made on a competitive basis, to local or roadside pits, which produce sand and gravel inferior to that obtained from the larger pits having special machinery for washing and grading the material. Complainants also point to increasing movements of sand and gravel by truck or barge where transportation of that character is available. It is predicted that many producers who rely on rail transportation alone will be forced out of business unless rates are substantially reduced.

Numerous reductions in rates on sand and gravel in central territory were made in 1921. A scale prescribed by the Public Utilities Commission of Michigan reduced rates on these materials in that state approximately 13 per cent, and intrastate rates in Ohio were lowered 28.6 per cent by order of the Public Utilities Commission, the effect of which was to remove the increase of 40 per cent granted in 1920. On October 21, 1921, we authorized carriers in central territory to file tariffs on five days' notice, reducing their interstate rates on sand and gravel to amounts equivalent to 115 per cent of the rates in effect prior to August 26, 1920, subject to the Michigan distance rates as minima. That reduction appears to have been quite generally made, but complainants insist that it was wholly inadequate.

Complainants assert that the average earnings on sand and gravel exceed average earnings on all traffic. There is a striking lack of uniformity in rates on these commodities in central territory. From exhibits showing rates charged for actual movements in the summer of 1921 it appears, for example, that a rate of 60 cents was applicable for various distances ranging from 5 to 45 miles, and that a rate of $1.12 applied on hauls from 10 to 180 miles in length. For hauls of 65 miles the rates charged ranged from 84 cents to $2.90, the weighted average being $1.20. Obviously, the average earnings on sand and gravel are difficult of ascertainment. Complainants show earnings on numerous shipments made by their members in July, 1921, and with few exceptions the revenues per car were less than the averages on all traffic reported for the same month by representative lines in central territory. While the earnings per ton-mile and per car-mile on sand and gravel were higher than those on all traffic, such comparisons are of little significance because of the fact that 87 per cent of the tonnage of sand and gravel moves a distance of 75 miles or less, while the average hauls of all traffic on most of the roads in central territory are in excess of 100 miles and, on some roads, of 200 miles. In *National Paving Brick Mfrs. Association vs. A. & V. Ry.*, 68 I. C. C., 213, 230, we called attention to the impracticability of using the revenue on all freight as an exact yardstick for measuring the rates on a particular commodity, even though it be low-grade traffic.

With respect to the issue of undue prejudice, it appears that competition between slag and gravel occurs principally in the steel-producing regions of Eastern Ohio and Western Pennsylvania. Prior to 1904 there was no commercial use for slag, which accumulated in large quantities as waste at the blast furnaces. To some extent it was used for filling in the same manner as cinders, and considerable amounts were dumped along the roadbeds of railroads, a small wasting charge sometimes being assessed for this service. About 1904, however, means were devised for crushing and cleaning slag and thereby adapting it to use as a construction material. Fostered in part by low rates established by the carriers, the slag industry had a rapid development, and slag is now considered superior to gravel for some purposes, because of its porosity and light weight. In 1915 a complaint was brought before the Public Utilities Commission of Ohio by producers of sand and gravel, who charged that they were prejudiced by the lower basis of rates on slag, and the carriers attempted to satisfy this complaint by raising their slag rates to the level of those on sand and gravel. Later they abandoned this course because of opposition from dealers in slag. In 1916 a distance scale of rates on slag was prescribed by the Ohio commission, and at about the same time a scale slightly higher was adopted by the carriers for intrastate application in Western Pennsylvania. This scale was so applied between Pennsylvania and West Virginia. . .

The carriers concede, as they did in *Increased Rates*, VTBJ, 58 I. C. C., 250 that rates on slag should not be less than on sand and gravel, but urge that the disparity should be corrected by arising the rates on slag rather than reducing those on gravel. From complainant's evidence it would seem that the alleged prejudicial relationship between slag and gravel exists principally with respect to interstate rates. A finding that the interstate rates on sand and gravel generally in central territory are prejudicial as compared with those on slag would not be warranted by the facts before us.

In our judgment the record affords insufficient basis for requiring a general reduction in rates on sand and gravel in central territory beyond that covered by our decision in *Reduced Rates*, VTBB, *supra*, We therefore find that the rates assailed, considered as a whole, are not unreasonable, unduly prejudicial, or otherwise unlawful.

Complaints also assail defendants' rules making minimum weights in connection with rates on sand and gravel the marked capacity of the car, stating that in endeavoring to secure maximum loading they frequently incur penalties for overloading. Since the hearing carriers in central territory have filed tariffs reducing their minimum weights to 90 per cent of marked capacity, which, we are informed, are satisfactory to complainants.

The complaint will be dismissed.

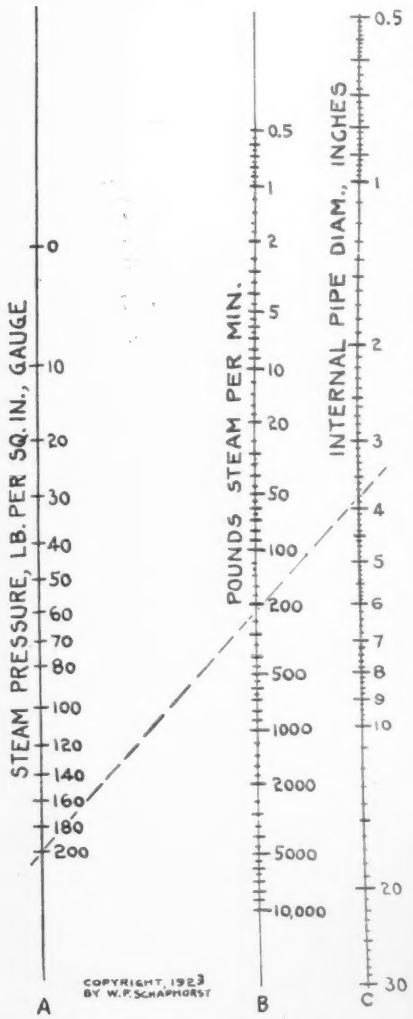
This decision merely confirms the report of the examiner in that nothing was to be done which would conflict with the decision in the general rate inquiry. In the latter a 10 per cent reduction was authorized on other traffic, and in view of the fact that a greater reduction had already been made between points in the Central States on sand and gravel, an exception was not permitted which would grant still greater reductions on the latter commodities.

It seems unfortunate that the case should have been heard and closely connected with the hearing in the general rate inquiry and decision issued in line therewith. A decision on the straight out and out question of the reasonableness of the level of rates should have given the complainants a favorable decision. Further emphasis is given to the fact that slag should not be on a lower basis than sand and gravel, but 2½ years have passed and the same apparent discrimination exists. The way seems to be clear, however, for a further attack against the intrastate level of rates in Western Pennsylvania before the state commission.

Hints and Helps for Superintendents

A Chart for Selecting Steam Pipe

A CHART that requires but one operation for the solution of a problem, and that is based upon the velocity of stream that is most commonly used—6,000 ft. per minute—has been made up



How to select steam pipe by chart

and copyrighted by W F. Schaphorst, Newark, N. J.

The chart may be used to determine the size pipe required when the steam pressure and the velocity are known, or it may be used to determine the velocity when the size of the pipe and the steam pressure are known.

For example, what size steam pipe shall be used where the pressure is 200 lb. and where 225 lb. of steam are to be used per minute? By placing a rule on the chart and running a line from point 200 in column A to point 225 in column B, the intersection of the line in column C is the answer, which, in this case, is 3.82 in. internal pipe diameter. Since such a size of pipe is not standard, it would be necessary to use a 4-in. line.

Or, if the steam pressure is known to be 140 lb. through a 3-in. pipe, the pounds of steam per minute may be determined by running the line through the 140 point in column A and through point 3 in column C. This line passes through point 100 in column B, which is the number of pounds per minute passing through the 3-in. line.

The chart is based on the following rule, which may be used for checking purposes or for working out the problem in longhand: Multiply the internal diameter of the pipe (in inches) by itself, multiply by 32.9 and then multiply by the weight of 1 cu. ft. of steam at the pressure used The result is the pounds of steam per minute that will be carried by the pipe. The weight of steam per cubic foot may be found in any engineers' handbook.

Ready to Fight Fires

FIRE is always a menace where a wooden plant or wooden buildings exist. Particularly is the danger great at most plants because they are located far from any effective fire fighting apparatus or from any organized fire fighting unit, and when a fire starts the action must be prompt if any of the inflammable parts of the plant are to be saved.

At the Allwood Lime Co.'s plant, located about seven miles from Manitowoc, Wis., a community has grown up consisting of a dozen or more buildings used as office, grocery store, and homes for employes. It would be useless to count on assistance from the Manitowoc fire department, and to afford a reasonable degree of safety an open-front shed is used for the storage of ladders and a large chemical fire-fighting equipment. Both pieces of equipment are on wheels which make them easily and quickly movable to any part of the property.

Not only does this equipment, ready for instant use, decrease the cost of fire insurance, but it is itself an added insurance which easily justifies its cost.

A Bottom-Driven Elevator

A DESIGNING engineer would say that a belt and bucket elevator could never be driven from the bottom, and for any but a small-size elevator this is probably true. In Kansas City, Mo., however, a bucket elevator of 26-ft. centers is operating successfully at the crushing plant of E. H. Bradbury.

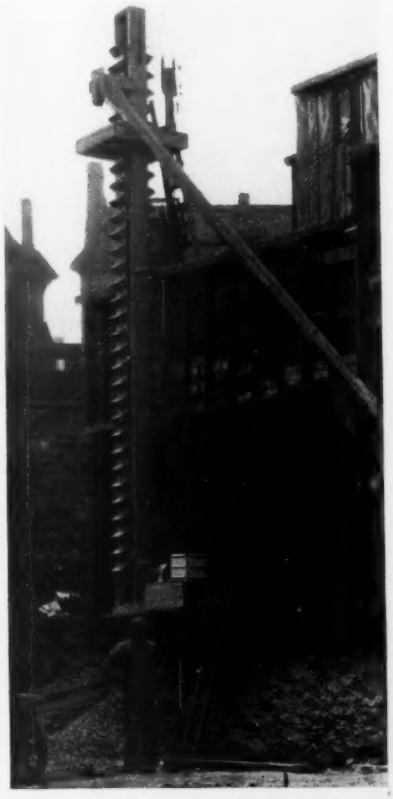
Sixty-seven 12-in. buckets, spaced at 10 in. on the belt, return the "rejects," or the material not passing the 1⅛-in. openings of the main screen, from the bottom of the rejects

FIRE APPARATUS WHERE IT'S NEEDED

Most rock products plants are without the protection of city or town fire apparatus. This ladder and chemical equipment protects the buildings and employes' homes at the Allwood Lime Co.

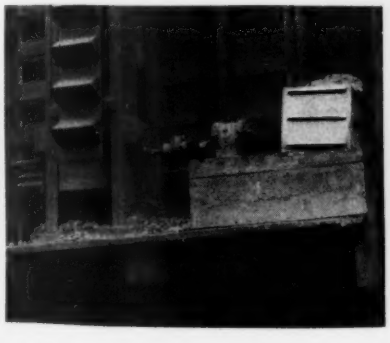
bin to the top of the plant where a gravity pipe chutes them back to the Williams hammer mill which does all the crushing at the plant.

In the two illustrations are shown the complete elevator and the details of the



This elevator is driven from the bottom, contrary to principles of design commonly followed. Conditions justify this bottom drive, and it works perfectly

drive at the bottom. The difficulty of mounting the motor at the top of the elevator is apparent. Added construction would be necessary, and when installed at the top the



The motor has a ventilated cover

lubrication, care, and repairs to the motor and drive would be difficult.

The bottom, or drive pulley, is mounted about 2 ft. below the chute from the rejects bin, with the lubrication provided from below since the tension blocks are above the shaft. Located on a convenient shelf at the side is a 3-hp. 1200-r.p.m. motor connected through a 26-to-1 James spur-gear reduction unit with flexible joints between motor and reducer and between reducer and drive pulley. The smaller illustration shows the galvanized cover over the motor to keep out dust, snow and rain, with horizontal openings for ventilation to prevent over-heating.

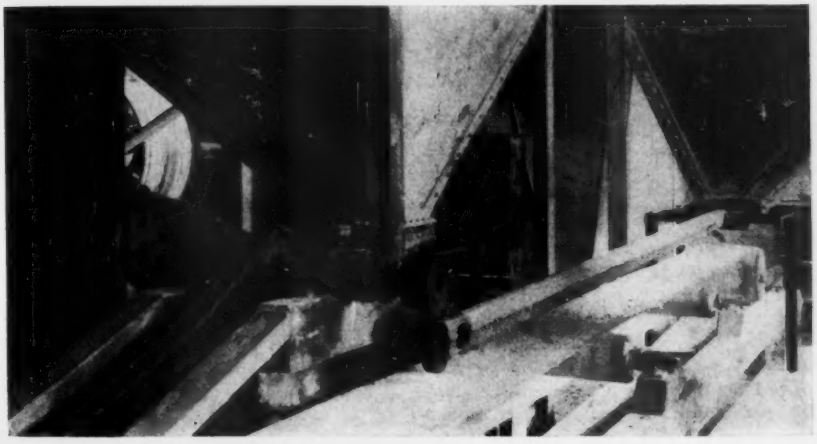
Tension is maintained by take-up boxes at the head about 580 lb. each side at the top and 330 lb. tight side and 130 lb. loose side at the bottom. The belt would safely stand over 1500 lb., so it is not stressed to anywhere near its safe working load. If driven from the top, the tensions would be about 450 lb. and 250 lb., not much of a saving. The increased journal friction and wear on the belt is negligible. These figures are maximum. Under some operating conditions they are considerably too high.

Continuous Mixing and Proportioning

TO get an accurately proportioned mixture of any two dry, fine materials, together with any desired uniform flow of these materials, a device similar to the ingenious one at a Wisconsin silica plant may be used. This machine was used at the Portage Silica Products Co. plant at the time sand-lime brick were manufactured there, and measured the two ingredients, sand and lime, which went into the brick.

Two bins located over a horizontal belt, with reciprocating motion unit-measuring devices in the place of the usual sliding bin gates, form the essential parts of this device. These parts are shown in the two accompanying illustrations.

About three inches below the horizontal bottom of each bin is a horizontal table. A sliding gate 3 in. thick to fit the space between the bottom of bin and the table has a solid section and a hollow section with sides but no top nor bottom. When this hollow section is under the bin opening, sand or lime drops into it and as it slides from under the bin a definitely measured quantity of material is carried in the framework until the open section is clear of the table and the material drops to the belt below. At the same time the solid portion of the framework comes under the bin opening and acts as a gate in closing the bin. As the slide returns, the opening in it again comes under the bin opening and is filled again with material which once more is brought back clear of the table and emptied to the belt below. This reciprocating motion of the sliding framework is automatically maintained by a long arm attached at one end to the sliding gate and at the other to a short arm revolving with a shaft to which it is keyed. The sliding gates for both



Accurate proportions and continuous flow of dry mixtures is what this apparatus accomplishes. The arrow points to the measuring receptacle in the sliding gate

bins are operated from the same shaft, so that the same number of measuresful of each material is obtained in the same period of time and the proportions of the mix are regulated by the relative size of the compartments in the sliding gates. The belt to which the material is delivered is continuous and delivers the mixed materials to a gravity chute for the next process in the manufacture.

Quarried from Life

By Liman Sandrock

Why E. H. Bradbury Succeeded

THE true engineer is built with a knack of solving the toughest of problems, no matter what it is. So when an engineer matches his wits against the troubles a stone quarry can cause, he's right in his element —and the more the difficulties, the better he likes it.

That's true enough of Edwin H. Bradbury, first an engineer, later a contractor, and now a producer of commercial crushed rock under some of the most difficult conditions that can be imagined in a single quarry.

Perhaps some of his never-say-die spirit comes from the stern atmosphere at the time of his birth, for he came to this earth just as the Civil War was raging most fiercely. His first 14 years were spent at the town of his birth, Dwight, Ill., from which he removed at the age of 14 to Topeka, Kans. At 18 he was graduated from the Topeka High School, and then followed eight years of engineering work as rodman, transitman, superintendent of track laying, and locating engineer for the Atchison, Topeka & Santa Fe railway.

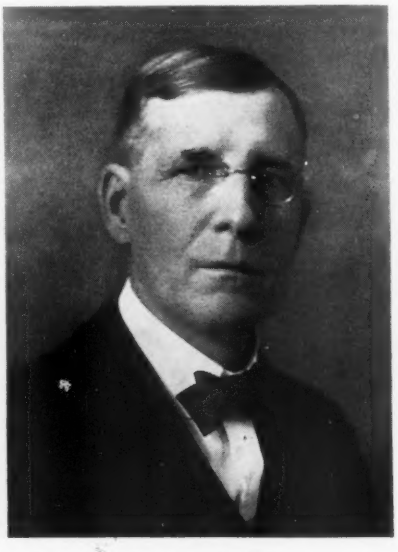
From 1889 to 1891 Mr. Bradbury was associated with L. J. Smith as Smith & Bradbury in railroad and city contract work. Since that time he has conducted a contracting business of his own.

Eight years ago he started to operate a rock crusher in the heart of Kansas City. In the beginning it was located on a narrow, out-of-the-way street with forbidding rock and shale bluffs. Consequently, its operation was not objectionable. As the years passed the bluffs were removed, the street widened and paved, and buildings erected. The operation of a crusher became a nuisance, and as such city authorities took drastic measures to prevent its operation.

A nearby piece of property 150x300 ft., in the business section of the city, with a 30-ft. depth of limestone was purchased for the continuation of the rock-crushing business. At the same time the quarrying of the rock would improve the property. But rock-crushing difficulties had just commenced for Mr. Bradbury.

With business and residential buildings on all sides the concussion, vibration, and danger from flying particles made quarrying a ticklish job, to say nothing of being a public nuisance if not carefully handled. Trucks could reach the plant only from one corner of the tract and on a level with the top of the original ledge during most of the life of the plant. Excessive dust and noise, which always exist at a crushing plant, would be nuisances not to be tolerated at this location. The brick wall of a business block stood on one property line of the tract.

These and other difficulties faced Mr. Bradbury in starting this new plant. They were not sufficient to keep him from his purpose, however. Today he has a plant



E. H. Bradbury

working without a hitch and without objection from surrounding property owners. The plant produces 250 to 300 tons a day. Some day his ability to overcome obstacles and his increasing experience in the stone business may make him a producer of—who knows how many tons a day?

At any rate, he is working in the right direction so far as an advanced conception of business relations and the proper treatment of employes are concerned. He believes in giving freely to his associates and to anyone interested the benefit of his own experience. His ambition is to run his business with sufficient skill so that he can pay the best of wages and meet any proper competition in price and service, and to see that his employes earn what they get and *get what they earn.*"

And, by the way, the methods used by Mr. Bradbury in overcoming these difficulties and designing a plant to meet the situation will be told in an early issue.

A "Rock Quarry" for Students

THE statement that college is a 4-yr. loaf is being disproved at Southwestern College, says a newspaper. The institution of "higher learning" has opened a stone quarry near the campus in which the men can get a real taste of the "heavies" to balance up their intellectual pursuits.

"Buggies," cranes, shovels, picks, and sledges serve to sufficiently emphasize the practical workaday side of life and put a check on idle idealism.

The quarry idea was originally inaugurated to supply rock for the new $200,000 gymnasium to be built there next spring, but so many additional orders poured in that the administration is now thinking seriously of making it a permanent means for students to earn their way.

They Said It

J. L. SHIELY SAYS: "The ambitions of our youths carry them away from a laborer's existence, and that is the rock upon which the labor supply is wrecked."

NO, ROLLO, brick tea is not made from a sand-lime brick. Chinese brick tea has a history of 5000 years. It is used chiefly as interior decoration.

TO THOSE READERS who contemplate visiting China during the quiet winter season we offer the following information on weights and measures: A "catty" is 1⅓ lb.; a "picul," 133⅓ lb.; a "mow" is a sixth of an English acre, and a "li" an eighth mile.

UNCLE SAM has invited us to visit the Brooklyn Army Stores and bid on "escort wagons and drinking carts." Alas! we have hitched our only wagon to a star. As for drinking carts—two alases!! and a sob!

JOE STUCKERJURGEN, states the *Davenport* (Iowa) *Democrat*, believes in acid phosphate—"it helped his corn." Tizz fine, this belief of Joe's. And it should make him feel his oats.

SAYS EDITOR MCPHERSON of *Quarry Managers' Journal*, England: "We have been invited to attend the National Crushed Stone Association's Convention at Chicago. We wish we could go, but must defer the pleasure to a future occasion. If any of our readers happen to be due in America on the dates mentioned, the invitation is also extended to them, and we should be very glad if they would represent our Institution there." Good hands-across-the-sea stuff, eh?

Editorial Comment

Research Work

Much misunderstanding exists in many quarters as to the real meaning of *research*, as applied to industry. There are many kinds of research. It does not necessarily involve chemical laboratories and testing machines. It means systematically assembling facts, information and data as well as the pursuit of new information. The hard-headed business man who reads and studies government bulletins, trade journals and other sources of information, and arranges in his head the data so gleaned, in such a way that he can use it, is applying research to his business, as well as the scientific expert who may be employed in his laboratory.

Technical or engineering research, generally, has one of two objectives: (1) To perfect the product studied, or cheapen its cost of production; (2) to extend the use of the product. The mere making of laboratory tests of materials and reporting their results is not research. The study and interpretation of these tests as in a broad way they affect the product or its uses is research.

These distinctions are important because many producers seem to think that the object of association or co-operative research laboratories is to make tests of their material for them at cut rates. Such tests very likely should be made for the benefit of the industry as a whole in acquiring knowledge of the material, but they should never be made with the object of furnishing the particular producer information for exclusive use in his sales or manufacturing work.

This is a special service for which the individual producer and not the industry as a whole should pay; and there are numerous commercial laboratories which make a business of giving just such service. Moreover, the tests reported by such a reputable commercial laboratory would have far more standing and weight as sales arguments than the same tests made in a laboratory maintained by an association to promote its own product—under ordinary conditions.

Current Price Quotations

An attempt has been made by the United States Court for the District of Southern New York to define in more specific terms than in the original act, the limitations on trade association activities under the Sherman anti-trust law. This decision is of extraordinary interest to the rock products industries, because it is the first attempt of the government authorities to define specifically the legitimate activities of trade associations, and also because it is a rock products industry that has been picked on as the example.

The Gypsum Industries Association is ordered dissolved and its members perpetually enjoined from doing certain things that it was never proved they did do. An attempt was made to indict the members of the association, but the federal grand jury refused to vote indictments on the testimony submitted. However, in order to know where they did stand, the gypsum manufacturers co-operated with the federal Department of Justice to get the court to give a consent decree.

The first point made is that an organization of producers or manufacturers for trade promotion purposes should be incorporated with specifically defined powers or objectives. This is doubtless to give a trade association a greater feeling of responsibility for its acts, and to make it easier to be sued for alleged violation of its charter privileges.

Practically all the usual activities of trade associations are permissible under this decree except any discussion or handling of prices, or discounts or other factors which affect prices. No trade association can, with any degree of safety, collect or disseminate in any way, shape or manner, information or data relating to prices.

Individually, producers and manufacturers can report current prices to editors of trade journals such as Rock Products, but any agreement among them, to be guided by such prices, would be a violation of the law. Of course, the law does not aim to prohibit nor can it be construed as prohibiting an individual from being guided in his own judgment by published prices.

Practically, the decision very much strengthens the position in the trade of such journals as Rock Products, which endeavor to keep their various industries informed of trade news, such as the current price of a commodity in different localities. In this particular case the publisher of Rock Products was called before the grand jury as a witness, but in no way was this journal a party to the case, nor was the legality of publishing price quotations, collected from individual producers at Rock Products' own initiative, ever under question.

Such news service as price quotations has been a recognized trade paper function for many years and could not be prohibited without involving the constitutional guarantee of the liberty of the press.

One thought more occurs to us in this connection and that is the importance of publishing real prices. We would rather producers made no quotations than to furnish us with anything but bona-fide prices. There is, of course, a temptation to make quotations of what one would *like to get*, rather than the *actual prices* at which the material is moving. Such misleading quotations hurt the producer, the industry, and the journal which publishes them. Every effort is made, and no expense is spared, to make Rock Products' price quotations accurate and reliable, and we ask the co-operation of every reader to that end.

Questions and Answers

Edmund Shaw, Consulting Engineer, Chicago, Ill., Expert on Problems of Screening, Washing and Hydraulic Separation

THE TECHNICAL STAFF OF ROCK PRODUCTS

Edwin Brooker, Washington, D. C., Consulting Expert on Matters of Transportation and Freight Rates

17. **Sources of Information on Glass Sand.**—We are making a study of sands used in the manufacture of glass and would like to know the sources of information on this subject. We believe the glass industry will expand into this vicinity in the near future and are desirous of developing our properties with this in mind.—A. O. A., Wisconsin.

A.—We refer you to the article in Rock Products of October 25, 1919, by F. Gelstharp, "Silica Rock and Sand for Glass Making." This article contained the essence of all the most valuable information on this subject.

We would also suggest that you send to the Missouri Bureau of Geology and Mines, Rolla, Mo., for a copy of its bulletin on the sand and gravel resources of Missouri, by Dake, published as Volume 15, second series.

You may also write to the Geological Survey of Kentucky, at Frankfort, Ky., for its book on "Glass Sands of Kentucky", by Charles Henry Richardson. This is one of the best textbooks on glass sand and the industry in general that we know of.—N. C. R.

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18. **When and Where Were Rock Crushers First Used?**—We would like to know the date and in what country rock crushers were first put into practical use. —N. H. M. Co., Pennsylvania.

A.—The first crusher used to crush stone was a jaw crusher, invented by a Mr. Blake, in New Haven, Conn., and was first used in the early fifties for crushing cobble and paving stone brought over from Europe as ballast in Dutch and Swedish ships.

The first gyratory crusher was the Gates, manufactured by the Allis-Chalmers Mfg. Co., South Milwaukee, Wis.—N. C. R.

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19. **Washing Clay Balls Out of Crushed Stone.**—Can you tell us of any method by which we can separate clay from our crushed stone? We find that in our finished product which is from 1½ in. down, it contains about 5 per cent clay balls practically the same size as the stone.—E. C. D., Missouri.

A.—Clay balls are the most difficult form of clay to remove by washing. Various forms of disintegrators are used for the purpose of breaking up the balls and then washing them out, but the only one which has given much success, so far as the writer's observation goes, is the log washer. This is a standard machine and it is generally used for the purpose in washing iron ore and phosphate rock. There are two or three sand and gravel plants which have installed them for removing clay balls from gravel. It ought to work well in washing crushed stone.

While the log washer is a simple machine, it has to be run in a certain way to get the best results. The speed, the inclination and the amount of water used are all important factors to be considered. In one plant in which the removal of clay balls was very complete, the writer noted that the water was kept down so that it was "soupy," because it contained so much clay. The rock was rinsed to remove the clay that was left on its suface by this clayey water.

In another type of machine the rock and clay balls are turned over and over in a cylinder, as in a tumbling barrel, while sprays of water play on the mass and wash away the disintegrated clay.

Successful experiments have been made with a machine called a jig, which is used in washing coal and also lead and zinc ore. The clay balls were removed but the capacity was so low that jigging was thought to be too expensive to use on such material as crushed stone or sand and gravel.—E. S.

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20. **Belgian Sand Free of Duty?**—We read in the *Glass Worker* that a duty of $4 per ton has been assessed on Belgian silver sand under the paragraph of the new tariff which stipulates a rate of $4 per ton on silica. Will you advise if this duty applies to Belgian sand used for steel molding at North Coast points?—C. T. W., Minnesota.

A.—An extract from the tariff issued in 1909 states: "Powdered silica in sand form is free of duty as sand." In other paragraphs the tariff stipulates no duty on any kind of sand.

No doubt the duty which has been assessed on Belgian sand was assessed under that paragraph which provides that crude silica, "not especially provided for," shall be subject to a tax at the rate of $4 per ton.

A recent communication from the Chief of the Division of Customs at Washington is as follows: "The question of whether or not Belgian sand, which is used in the manufacture of glass, is dutiable at the rate of $4 per ton under the provisions in Paragraph 207 of the Tariff Act, for silica, crude, not specially provided for, has been given thorough consideration by the department, and the conclusion reached was to the effect that since the article in question is commercially known as sand, it is entitled to admission free of duty under Paragraph 1675 of the Tariff Act. The Collector of Customs at San Francisco, in a letter dated December 16, was directed to admit such sand free of duty."—G. M. E.

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21. **Market for Scouring Sand.**—I have large deposits of a scouring powder on my property which is similar to that sold as "Dutch Cleanser." Can you advise as to what other uses this material can be put? I wonder if it might be used for polishing purposes in machine shops or as a moulding sand.—S. C., South Dakota.

A.—There is a considerable demand for this material for the making of soap powder, yet the material is so plentiful that usually nearness to market is practically the deciding factor. If there are soap manufacturers near you who could use the material, you probably have a good opportunity to market it, otherwise we cannot say just what uses could be made of your material.—N. C. R.

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22. **Books on the Manufacture of Portland Cement.**—Will you advise where I can secure treatises on the manufacture of portland cement, by both the dry and the wet processes?—G. M. H., Pennsylvania.

A.—We suggest the following three books on the subject:

"Cement," by Bertram Blount, published by Longman, Green & Co., Fourth avenue and 30th street, New York City.

"The Portland Cement Industry," by William Alden Brown, published by Crossley Lockwood & Son, 7 Stationers' Hall Court, Ludgate, England.

"Portland Cement," by Richard K. Meade, published by Chemical Publishing Co., Easton, Pa.

If you have available some old files of Rock Products, you will find a great deal of available information on current practice in portland cement manufacturing. If you so advise, we shall be glad to give you a list of the articles we have published for any period for which you may have files of the magazine available.—C. S. D.

New Machinery and Equipment

Chain Drives for Cement Mills and Other Abrasive Surroundings

SUPERINTENDENTS and operating men in cement mills and other locations where abrasives are present will be interested, says the Link-Belt Co., Chicago, in improved drive chains now available.

This chain drives from a worm gear speed reducer to a 12-in. screw conveyor at 55 r.p.m. in a cement mill

A great advance has been made by the company in its No. SS-40, an all-steel bushed roller chain which operates on the standard No. 103 sprocket wheels. One mill superintendent who had a troublesome drive reported that he put on a new malleable iron chain about every month. When he changed to manganese, the chain would last about two months, but when he substituted No. SS-40, the drive was good for at least two years.

This chain has close-fitting but freely revolving rollers. This eliminates the rubbing of the chain going on and off the teeth and rims of the wheels, greatly reducing the friction and wear. In the presence of abrasive material, which gets between the sprocket wheel and the chain, rollers are especially needed, because the chain with rollers comes to a seat on the sprocket without any sliding action.

No. SS-40 chain has rolled steel side bars, made exactly to pitch, case-hardened smooth finished pins, and case-hardened smooth bushings securely held in the side bars, making smooth, close fitting joints, with hard long-wearing surfaces. An accompanying illustration shows link parts.

The latest improvement is the adoption on the No. SS-40 chain of the company's curled roller, which has been used for a long time on the higher-priced, high-speed roller chains, such as are used on trucks, tractors, etc. The rolled steel strip used to make the curled roller is of a special grade, refinement, and analysis of metal. Every process of its manufacture develops a fibrous instead of a granular structure. The fiber of the metal runs around the roller, which gives it strength and resiliency and resistance to shock. The break in the metal circle eliminates internal strains and presents an opportunity for slight spring, which cushions the shocks and materially increases the life of the chain. The rollers are accurately made and finished to such close clearances that gritty dirt does not work into the joints.

The combination of this all-steel roller chain with accurately fitted flint-rim wheels gives long life to the drive. This has been demonstrated by practical experience in many cement mills and other locations where drives are exposed to abrasive materials, thus reducing maintenance charges and costly shutdowns.

Similar all-steel roller chains for other standard drive chain sprockets are made by the company, such as No. SS-88 for No. 88 sprockets; SS-114 for No. 114 sprockets; and SS-124 for No 124 sprockets.

Showing the various parts of the chain link

Beg Pardon

THROUGH an error, malleable iron chain was advertised under the name of the Inland Engineering Co. of Chicago in the December 30 issue of ROCK PRODUCTS. This company does not supply malleable iron parts; it specializes in manganese, chrome and carbon steel castings.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Blakeslee, N. Y.	1.00	1.25	1.10	1.10	1.10	
Buffalo, N. Y.	1.50 per net ton all sizes					
Chaumont, N. Y.	1.00		1.50	1.25	1.25	1.25
Cobleskill, N. Y.	1.25	1.25	1.25	1.25		
Coldwater, N. Y.	1.50 per net ton all sizes					
Eastern Penna.	1.35	1.35	1.35	1.35	1.35	1.35
Munns, N. Y.	1.00	1.25	1.25	1.25	1.25	
Prospect, N. Y.	.80	1.25	1.25	1.25	1.25	
Walford, Pa.		1.30	1.30	1.30	1.30	1.30
Western New York	.75	1.20	1.20	1.20	1.20	1.20
CENTRAL						
Alton, Ill.	1.50		1.50	1.35		
Buffalo, Iowa	1.00		1.35	1.15	1.20	1.20
Chasco, Ill.	1.30	1.25	1.25	1.25	1.20	
Chicago, Ill.	1.30	1.70	1.30	1.30	1.30	
Dundas, Ont.	1.00	1.35	1.35	1.25	1.10	1.10
Faribault, Minn.					1.75	
Greencastle, Ind.	1.25	1.10	1.00	.90	.90	.90
Krause, Columbia and Valmeyer, Ill.	1.00@1.30	1.00@1.30	1.00@1.30	1.00@1.30	1.00@1.30	1.30@1.50
Lannon, Wis.	.65		.95	.85	.85	.85
Mitchell, Ind.	.80	.80	.80	.80	.80	.80
Montreal, Canada	.80	1.35	1.05	.95	.90	
Montrose, Ia.		1.50	1.60	1.55	1.45	1.40
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	
Southern Illinois	1.35	1.40	1.35	1.30	1.25	
Stolle, Ill. (I. C. R. R.)	1.30		1.35	1.35	1.35	1.35
Stone City, Iowa	.75		1.40	1.30	1.25	
Toledo, Ohio	1.60	1.70	1.70	1.70	1.60	1.60
Toronto, Canada	1.90	2.25	2.25	2.25	2.00	2.00
Waukesha, Wis.	Prices include 90c freight. All sizes 1.05 (less .05 ton discount 10 days)					
SOUTHERN:						
Alderson, W. Va.	.75	1.25	1.40	1.25	1.15	
Bridgeport, Texas	1.25	1.40	1.40	1.40	1.25	1.25
Bromide, Okla.	.75			1.50	1.50	
Cartersville, Ga.		2.00	1.25	1.25	1.25	
Chickamauga, Tenn.	.80@1.00	.80@1.25		.80@1.00	.80@1.00	
El Paso, Tex.	1.00	1.00	1.00	1.00	1.00	
Ft. Springs, W. Va.	.75	1.25	1.40	1.25	1.20	
Garnet and Tulsa, Okla.	.50	1.60	1.60	1.45	1.45	
Ladds, Ga.			1.40	1.40	1.40	
Morris Spur (near Dallas) Tex.	1.00	1.40	1.40	1.40	1.40	1.25
WESTERN:						
Atchison, Kans.	.50	1.80	1.80	1.80	1.80	1.80
Blue Springs and Wymore, Neb.	.20	1.65	1.60	1.55	1.45	1.40
Cape Girardeau, Mo.	1.35		1.10	1.35	1.10	
Kansas City, Mo.	1.00	1.50	1.50	1.50	1.50	1.40

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Branford, Conn.	.60	1.50	1.25	1.15	1.00	
Bound Brook, N. J.	1.80	2.30	1.90	1.50	1.40	
Dresser Jct., Wis.	1.00	2.25		1.75	2.00	
Duluth, Minn.	.90@1.00	2.00@2.25	1.75@2.00	1.40@1.50	1.30@1.40	
E. Summit, N. J.	2.30	2.50	2.20	1.90	1.60	
Eastern Massachusetts	.60	1.85	1.40	1.40	1.40	1.40
Eastern New York	.75	1.50	1.30	1.30	1.40	1.40
Eastern Pennsylvania	1.15	1.50	1.45	1.35	1.30	1.30
New Britain, Middlefield, Rocky Hill, Meriden, Conn.	.60	1.35@1.45	1.15@1.25	1.05	.95@1.00	
Oakland, Calif.	1.75	1.75	1.75	1.75	1.75	
Richmond, Calif.	.50*		1.50*	1.50*	1.50*	
Spring Valley, Calif.	.70	1.55	1.50	1.40	1.35	1.35
Springfield, N. J.	1.75	2.10	2.10	1.80	1.80	1.75
Westfield, Mass.	.60	1.35	1.25	1.10	1.00	

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Buffalo, N. Y.—Granite	.90		1.20	1.00	1.05	1.10
Berlin, Utley and Red Granite, Wis.	1.50	1.60	1.40	1.30	1.30	
Columbia, S. C.—Granite	.50		2.00@2.50	2.00		1.75@2.00
Dundas, Ont.—Limestone	1.00	1.35	1.35	1.25	1.10	1.10
Eastern Penna.—Sandstone	.85	1.55	1.55	1.40	1.35	1.30
Eastern Penna.—Quartzite	1.20	1.30	1.20	1.20	1.20	1.20
Lithonia, Ga.—Granite	1.00		1.50	1.25	1.00	1.00
Lohrville, Wis.—Cr. Granite	1.35	1.40	1.30		1.20	
Middlebrook, Mo.—Granite	3.00@4.00		2.25@2.50	2.00@2.25		1.50
San Diego, Calif.	.50@.70	1.45@1.75	1.40@1.70	1.30@1.60	1.25@1.55	1.25@1.55
Sioux Falls, S. D.—Granite	1.00	1.60	1.55		1.50	

*Cubic yard. †Agrl. lime. ‖R. R. ballast. §Flux. ‡Rip-rap, a 3-inch and less.

Agricultural Limestone

(Pulverized)

Chaumont, N. Y. — Analysis, 95% $CaCO_3$, 1.14% $MgCO_3$ — Thru 100 mesh; sacks, 4.00; bulk	2.50
Grove City, Pa. — Analysis 94.89% $CaCO_3$, 1.50% $MgCO_3$; 60% thru 100 mesh; 45% thru 200 mesh; sacks, 4.50; bulk	3.00
Hillsville, Pa.—Analysis, 90% $CaCO_3$ 1.00% $MgCO_3$; 90% thru 100 mesh; bulk	4.50
Jamesville, N. Y. — Analysis, 89.25% $CaCO_3$; 5.25% $MgCO_3$; 95% thru 50 mesh; bags, 4.00; bulk	2.50
New Castle, Pa.—89% $CaCO_3$, 1.4% $MgCO_3$—75% thru 100 mesh, 84% thru 50 mesh, 100% thru 10 mesh; sacks, 4.75; bulk	3.00
Walford, Pa.—Analysis, 50% thru 100 mesh; 4.50 in paper; bulk	3.00
West Stockbridge, Mass., Danbury, Conn., North Pownal, Vt.—Analysis, 90% $CaCO_3$—50% thru 100 mesh; paper bags, 4.25—cloth, 4.75; bulk	3.00
Alton, Ill.—Analysis, 97% $CaCO_3$, 0.1% $MgCO_3$; 90% thru 100 mesh	5.00
99% thru 200 mesh	8.00
Belleville, Ont. — Analysis, 90.9% $CaCO_3$, 1.15% $MgCO_3$—45% to 50% thru 100 mesh, 61% to 70% thru 50 mesh; bulk	2.50
Chasco, Ill.—Analysis 96.12% $CaCO_3$, 2.5% $MgCO_3$; 90% thru 100 mesh	5.00
Pulverized limestone	1.35
Detroit, Mich.—Analysis, 88% $CaCO_3$, 7% $MgCO_3$—75% thru 200 mesh, 2.50@4.75—60% thru 100 mesh	1.80@3.80
Marblehead, Ohio — Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 60% thru 100 mesh; 70% thru 50 mesh; 100% thru 10 mesh; sacks	4.50
Bulk	3.00
Piqua, Ohio—70% thru 100 mesh; bags, 5.00; bulk	3.50
90% thru 100 mesh; bags, 7.00; bulk	5.50
Yellow Springs, Ohio—Analysis 96.08% $CaCO_3$, 63% $MgCO_3$; 32% thru 100 mesh; 95.57%, sacked, 6.00; bulk	4.25
Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$; 50% thru 100 mesh	1.50
Hot Springs, N. C.—50% thru 100 mesh, sacks, 4.25; bulk	3.00
Knoxville, Tenn.—80% thru 100 mesh	2.70
Bags	3.95
Linville Falls, N. C.—Analysis, 57% $CaCO_3$, 39% $MgCO_3$; 50% thru 100 mesh; bulk	2.75
Mountville, Va. — Analysis, 76.60% $CaCO_3$, 22.83% $MgCO_3$—50% thru 100 mesh; 100% thru 20 mesh; sacks	5.00
Colton, Calif.—Analysis, 95% $CaCO_3$, 3% $MgCO_3$—all thru 20 mesh—bulk	4.00
Lemon Cove, Calif. — Analysis 94.8% $CaCO_3$, 0.42% $MgCO_3$; 60% thru 200 mesh; sacks, 5.25; bulk	4.50

Agricultural Limestone

(Crushed)

Alton Ill.—Analysis 97% $CaCO_3$, 0.1% $MgCO_3$; 90% thru 50 mesh	1.50
Bellevue, Ohio — Analysis, 61.56% $CaCO_3$, 36.24% $MgCO_3$; ¼ in. to dust, about 20% thru 100 mesh	1.25
Bettendorf, Ia., and Moline, Ill.—97% $CaCO_3$, 2% $MgCO_3$—50% thru 100 mesh; 50% thru 4 mesh	1.50
Buffalo, Ia.—90% thru 4 mesh	1.00
Cape Girardeau, Mo. — Analysis, 93% $CaCO_3$, 3.3% $MgCO_3$; 50% thru 4 mesh	1.35
90% thru 4 mesh, cu. yd.	1.35
Chicago, Ill.—Analysis, 53.63% $CaCO_3$, 37.51% $MgCO_3$; 90% thru 4 mesh	1.00
Columbia, Ill., near East St. Louis—½-in. down	1.25@1.80
Elmhurst, Ill. — Analysis, 35.73% $CaCO_3$, 20.69% $MgCO_3$—50% thru 50 mesh	1.25
Huntington and Bluffton, Ind.—Analysis 61.56% $CaCO_3$, 36.24% $MgCO_3$; about 20% thru 100 mesh	1.25
Greencastle, Ind. — Analysis, 98% $CaCO_3$—50% thru 50 mesh	2.00
Kansas City, Mo.—50% thru 100 mesh	1.50
Krause and Columbia, Ill.—Analysis, 90% $CaCO_3$, 90% thru 4 mesh	1.20

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Agricultural Limestone

(Continued from preceding page.)

Lannon, Wis.—Analysis 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh	2.00
Screenings (¼ in. to dust)	1.00
Marblehead, O.—Screenings, 40% thru 100 mesh	1.25
Milltown, Ind.—Analysis 94.41% $CaCO_3$, 2.95% $MgCO_3$; 33.6% thru 100 mesh, 40% thru 50 mesh	1.25@1.65
Mitchell, Ind.—Analysis, 97.65% $CaCO_3$, 1.76% $MgCO_3$, pulverized limestone	1.50
Montrose, Ia.—90% thru 100 mesh	1.25
Narlo, Ohio—Analysis 56% $CaCO_3$, 43% $MgCO_3$, limestone screenings, 37% thru 100 mesh; 55% thru 50 mesh; 100% thru 4 mesh	1.50@2.00
Ohio (different points), 20% thru 100 mesh; bulk	1.25@1.50
River Rouge, Mich.—Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk	.80@1.40
Stolle, Ill., near East St. Louis on I. C. R. R.—Thru ⅛-in. mesh	1.30
Stone City, Ia.—Analysis, 98% $CaCO_3$ 50% thru 50 mesh	.75
Toledo, Ohio—¼-in. to dust, 20% thru 100 mesh	1.50
Waukesha, Wis.—No. 1 kiln dried	2.00
No. 2 Natural	1.75
Alderson, W. Virginia—Analysis 90% $CaCO_3$; 90% thru 50 mesh	1.75
Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$	2.00
90% thru 4 mesh	1.50
Cartersville, Ga.—Analysis 66% $CaCO_3$, 33% $MgCO_3$—all passing 10 mesh	1.75
Claremont, Va.—Analysis, 92% $CaCO_3$, 2% $MgCO_3$; 90% thru 50 mesh	3.00
50% thru 50 mesh; 90% thru 4 mesh; 50% thru 4 mesh	2.75
Ft. Springs, W. Va.—Analysis, 90% $CaCO_3$—90% thru 50 mesh	1.25
Ladds, Ga.—50% thru 50 mesh	2.00
Garnett, Okla.—Analysis, 80% $CaCO_3$, 3% $MgCO_3$; 50% thru 50 mesh	.50
Kansas City, Mo., Corrigan Sid'g—50% thru 100 mesh; bulk	1.80
Tulsa, Okla.—90% thru 4 mesh	.50

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

GLASS SAND:

Berkeley Springs, W. Va. (damp)	2.50
Cedarville and South Vineland, N. J.—Damp, 1.75; dry	2.25
Cheshire, Mass.	5.00@10.00
Columbus, Ohio	1.50@ 2.00
Dunbar, Pa. (damp)	2.50
Falls Creek, Pa.	2.25
Hancock, Md.—Damp, 1.50; dry	2.00
Klondike and Pacific, Mo.	2.50
Mapleton, Pa.—Damp, 2.00; dry	2.75
Massillon, Ohio	3.00
Michigan City, Ind.	.50@ .55
Mineral Ridge, Ohio	2.75@ 3.00
Montoursville, Pa.	1.75
Oregon, Ill.	1.50@ 2.00
Ottawa, Ill.	2.50
Pittsburgh, Pa.—Dry, 4.00; damp	3.00
Rockwood, Mich.	2.50@ 3.00
Round Top, Md.—Damp, 1.50; dry	2.00
Sands, Pa.	2.50
San Francisco, Cal.	3.00@ 3.50
St. Mary's, Pa.	2.25
Thayers, Pa.	2.50
Utica, Ill.	1.25@ 1.50
Zanesville, Ohio	2.00@ 2.50

FOUNDRY SAND:

Albany, N. Y.—Sand blast (dry)	4.00
Molding fine and brass molding	2.50
Molding coarse	2.25
Allentown, Pa.—Core and molding fine	1.50@1.75
Arenzville, Ill.—Molding fine	1.50@1.75
Brass molding	2.00
Beach City, O.—Core, washed and screened	2.00@2.50
Furnace lining	2.50@3.00
Molding fine and coarse	2.25@2.50
Cheshire, Mass.—Furnace lining, molding, fine and coarse	5.00
Sand blast	5.00@8.00
Stone sawing	6.00
Cleveland, O.—Molding coarse	1.50@2.00
Brass molding	1.50@2.00
Molding fine	1.50@2.25
Core	1.25@1.50
Columbus, Ohio—Core	.50@1.50
Sand blast	3.50@5.00
Molding fine	2.75@3.00
Molding coarse	2.50@3.00
Brass molding	2.50@3.00

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Wholesale Prices of Sand and Gravel

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Ambridge and So. Heights, Pa.	1.15	1.15	1.15	1.15	.70	.70
Erie, Pa.		.60	.90		1.00	
Farmingdale, N. J.	.48	.48	1.00	1.00	1.20	
Hartford, Conn.	.90		1.25	1.15	1.15	1.15
Leeds Junction, Me.		.50	1.75	1.35	1.35	1.25
Machias, N. Y.	.75	.75	1.25	.85	.85	.85
Pittsburgh, Pa.	1.15	1.15	1.00	.70	.70	.70
Portland, Maine		.50	1.75		1.35	1.35
Washington, D. C. (rewashed, river)	.75	.75	1.60	1.40	1.20	1.20
CENTRAL:						
Alton, Ill.		.85				
Anson, Wis.	.50	.40				.90
Barton, Wis.	.60		.70	.70	.70	.70
Beloit, Wis.		.70			.80	
Chicago, Ill.		1.75@2.23	1.75@2.43			
Cincinnati, Ohio	.70	.65	.90	.90	.90	.90
Columbus, Ohio	.75	.75@1.25	.75@1.25	.75@1.25	.75@1.25	.75@1.25
Des Moines, Iowa	.60	.60	1.70	1.70	1.70	1.70
Earlestead (Flint), Mich.	.70	60-40 sieves, .85; Pebbles, .95				
Eau Claire, Wis.	.50	.45	1.25			.90
Elkhart Lake, Wis.		.50			.60	.60
Ft. Dodge, Ia.		1.22		2.17		
Grand Rapids, Mich.		.50		.80		.70
Hamilton, Ohio		.90			.90	
Hawarden, Ia.		.50			1.60	
Hersey, Mich.	.40	.40			.70	
Indianapolis, Ind.	.60	.60		1.50	.75@1.00	.75@1.00
Janesville, Wis.		.65@ .75			.65@ .75	
Mason City, Ia.	.70	.60	1.50	1.75	1.65	1.60
Milwaukee, Wis.	1.06	1.06	1.26	1.26	1.26	
Minneapolis, Minn.	.35	.35	1.25@1.35	1.25@1.35	1.25	1.25
Moline, Ill.	1.00	1.00	1.60	1.60	1.60	1.60
Riton, Wis.		.60			.80	
St. Louis, Mo., f.o.b. cars	1.20	1.45	1.65	1.45		1.45
St. Louis, Mo., deliv. on job	2.05	2.20	2.35	2.15		2.10
Summit Grove, Clinton, Ind.	.65@ .75	.60@ .75	.60@ .75	.60@ .75	.60@ .75	.60@ .75
Terre Haute, Ind.	1.00	1.00	1.25	1.25	1.00	1.00
Waukesha, Wis.	.55	.55	.80	.80	.80	.80
			(.05 ton discount 10 days)			
Winona, Minn.	.50	.40	1.25	1.25	1.25	1.25
SOUTHERN:						
Birmingham, Ala.	1.48		all gravel 1.88			
Charleston, W. Va.	all sand 1.40		all gravel 1.50			
Estill Springs, Tenn.	1.35	1.15		1.00	.85	.65
Ft. Worth, Tex.	1.50@2.00	1.50@2.00	1.50@2.00	1.50@2.00	1.50@2.00	1.50@2.00
Jackson's Lake, Ala.	.50@ .60	.50@ .60	.40@1.00	1.00	.50@1.00	.50@1.00
Knoxville, Tenn.	.75@1.00	.75@1.00		1.00	1.00	1.00
Lake Weir, Fla.		60				
Macon, Ga.		.50@ .75				
Memphis, Tenn.	1.12	1.12				1.95
N. Martinsville, W. Va.		1.00	1.20		1.00	.80
New Orleans, La.		.50			1.00	
Pine Bluff, Ark.	1.20	.90	Washed gravel, all sizes, 2.25			
Roseland, La.		.25		.85		
WESTERN:						
Grand Rapids, Wyo.	.50	.50	.85	.85	.80	.80
Kansas City, Mo.	(Kaw River sand, car lots, .75 per ton. Missouri River, .85)					
Los Angeles, Calif.		.70	1.20	1.20	1.10	1.10
Pueblo, Colo.	1.10*	.90*		1.25*		
San Diego, Calif.	.80@1.00	.80@1.00	1.30@1.60	1.25@1.55	1.15@1.45	1.15@1.45
San Francisco, Calif.		1.00	1.00@1.20	.85@1.00	.85@1.00	.85@1.00
Seattle, Wash.	1.00*	1.00*	1.00*	1.00*		1.00*
Spring Valley, Calif.	.70	.80	1.40	1.35	1.25	1.25

Bank Run Sand and Gravel

City or shipping point—	Fine sand, 1/10 inch	Sand, ¼ inch	Gravel, ½ inch	Gravel, 1 inch	Gravel, 1½ inch	Gravel, 2 inch
Boonville, N. Y.	.60@ .80		.55@ .75			1.00
Cape Girardeau, Mo.			River sand, 1.00 per yd.			
Cherokee, Iowa			.80 per ton—1.20 washed			
Dudley, Ky. (crushed sand)	1.00	1.00		.90		
East Hartford, Conn.			.65 per cu. yd.			
Elkhart Lake, Wis.	.70	.50			.60	.60
Estill Springs, Tenn.						.85
Fishers, N. Y.		.50@ .65		.50@ .65		
Grand Rapids, Mich.						.50
Hamilton, Ohio			.45 per cu. yd. in pit			
Hartford, Conn.		1.00*				
Hersey, Mich.				.50		
Indianapolis, Ind.			Mixed gravel for concrete work, .65			
Lindsay, Texas						.55
Janesville, Wis.		.65			.65@ .75	
Pine Bluff, Ark.			Road gravel .50			
Rochester, N. Y.	.60@ .75	.60@ .75			.50@ .65	.50@ .65
Roseland, La.		.75				
Saginaw, Mich., f.o.b. cars		.75	1.30	1.30	1.30	1.30
St. Louis, Mo.			60% gravel, 40% sand, 1.55			
Summit Grove, Ind.	.50	.50	.50	.50	.50	.50
Waco, Texas		.80		1.50		1.30
Winona, Minn.			Clean pit run .60			
York, Pa.		.95@1.10	(crushed rock sand)			

* Cubic yard: B Bank. L Lake. ‖ Ballast.

Crushed Slag

City or shipping point	Roofing	¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:							
Buffalo, N. Y.	2.35	1.35	1.35	1.35	1.35	1.35	1.35
E. Canaan, Conn.	4.00	1.00	2.50	1.35	1.25	1.25	1.25
Eastern Pennsylvania and Northern New Jersey	2.00	1.20	1.50	1.20	1.20	1.20	1.20
Easton, Pa.	2.00	.80	1.25	.90	.85	.80	.80
Erie, Pa.	2.35	1.35	1.35	1.35	1.35	1.35	1.35
Emporium, Pa.			1.35	1.35	1.35	1.35	1.35
Sharpsville and West Middlesex, Pa.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
Western Pennsylvania	2.00	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Chicago, Ill.			All sizes, 1.50, F. O. B. Chicago				
Detroit, Mich.			All sizes, 1.65, F. O. B. Detroit				
Ironton, O.	2.05	1.45	1.80	1.45	1.45	1.45	1.45
Steubenville, O.	2.00	1.40	1.70	1.40	1.40	1.40	1.40
Toledo, O.	1.75	1.50	1.50	1.50	1.50	1.50	1.50
Youngstown, Dover, Hubbard, Leetonia, Struthers, O.	2.00	1.25	1.50	1.25	1.25	1.25	1.25
Steubenville, Lowellville and Canton, O.	2.00	1.35	1.60	1.35	1.35	1.35	1.35
SOUTHERN:							
Ashland, Ky.		1.55		1.55	1.55	1.55	1.55
Birmingham, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Ensley, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Longdale, Goshen, Glen Wilton & Low Moor, Roanoke, Va.	2.50	1.00	1.00	1.25	1.25	1.15	1.05

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing Hydrate	Masons' Hydrate	Agricultural Hydrate	Chemical Hydrate	Ground Burnt Lime Blk.	Ground Burnt Lime Bags	Lump Lime Blk.	Lump Lime Bbl.
EASTERN								
Adams, Mass.			7.00				2.90	
Bellefonte, Pa.		10.50§	10.50§	10.50§	9.00		8.50	1.80
Buffalo, N. Y.		12.00		12.00				
Berkley, R. I.			12.00					2.30
Chaumont, N. Y.					2.50	4.00		
Lime Ridge, Pa.							5.00	
West Rutland, Vt.	13.50	12.00		13.50			10.00	
West Stockbridge, Mass.								2.25
Williamsport, Pa.			10.00			10.00	6.00	
York, Pa. (dealers' prices)		10.50	10.50	12.50			8.50	1.65*
Zylonite, Mass.	3.20d	2.90d	7.00					
CENTRAL:								
Delaware, Ohio		10.00	9.50	10.50			9.00	1.60
Gibsonburg, Ohio					8.00			
Huntington, Ind.		10.00					9.00	
Luckey, Ohio	11.50	10.00	10.00					
Marblehead, Ohio		10.00	10.00				9.00	1.60
Marion, Ohio		10.00	10.00				9.00	
Mitchell, Ind.		12.00	12.00	12.00	11.00		10.00	1.60
Sheboygan, Wis.								7.50d
White Rock, Ohio	11.50				8.00	10.00		
Woodville, O. (dlrs.' price)	11.50a	10.00a	10.00a	11.00a			9.00	1.60
SOUTHERN:								
Erin, Tenn.							8.50	1.50
El Paso, Tex.							7.00	1.50
Karo, Va.							7.00	1.30
Knoxville, Tenn.	18.00	11.00@12.00		11.00@12.00	10.00	11.00	8.50	1.50
Ocala and Zuber, Fla.	13.00			13.00			12.00	1.60
Sherwood, Tenn.	12.50	11.00	11.00	11.00	8.50		8.50	1.50
Staunton, Va.					5.00	6.00	8.00	1.40
WESTERN:								
Colton, Calif.			15.00				19.70	
Kirtland, N. M.							12.50	
San Francisco, Calif.	22.00	22.00	15.00	22.00			16.00	2.15*
Tehachapi, Calif.							13.00	2.10

‡100-lb. sacks; *180-lb. net, price per barrel; †180-lb. net, non-returnable metal barrel; §Paper sacks. (a) 50-lb. paper bags; terms, 30 days net; 25c per ton or 5c per bbl. discount for cash in 10 days from date of invoice. (b) Burlap bags. (c) 200-lb. bbl. (d) 280-lb. bbl. net.

Miscellaneous Sands

(Continued from preceding page)

Delaware, N. J.—Molding fine	2.00
Molding coarse	1.90
Brass molding	2.15
Dresden, O.—Core and traction	1.00
Molding, fine and coarse	1.25
Brass molding	1.50
Dunbar, Pa.—Traction, damp	2.50
Dundee, O.—Glass, core, sand blast, traction	2.50
Molding fine, brass molding (plus 75c for winter loading)	2.00
Molding coarse (plus 75c for winter loading)	1.75
Eau Claire, Wis.—Core	1.00
Sand blast	3.25@3.75
Falls Creek, Pa.—Molding, fine and coarse	1.75
Sand blast	2.00
Traction	1.75
Franklin, Pa.—Core	1.25@1.75
Furnace lining	2.50
Molding fine	2.00
Molding coarse	1.75
Brass molding	2.00
Greenville, Ill.—Molding coarse	1.75@2.00
Joliet, Ill.—No. 2 molding sand and loam for luting purposes; milled	.80
Bank run	.65
Kansas City, Mo.—Missouri River core	.80
Kasota, Minn.—Stone sawing	1.30@1.50
Klondike, Pacific, Gray Summit, Mo.—Molding fine and coarse	2.00
Molding fine	2.00
Mapleton, Pa.—Glass, core, furnace lining, molding fine and coarse; damp 2.00, dry	2.75
Massillon, O. — Traction, molding fine and coarse, furnace lining, core	2.75
Brass molding	3.00
Michigan City, Ind.—Core, traction	.40@ .45
Mineral Ridge, Ohio—Core, molding fine, sand blast (green)	2.25
Furnace lining (green)	1.75@2.00
Roofing sand, stone sawing, traction (green)	2.00
Sand blast (dry)	2.75
Montoursville, Pa.—Core	1.25@1.35
Traction	1.00
Molding fine	1.50
Molding coarse	1.50@2.00
New Lexington, O.—Molding fine	2.00
Molding coarse (.75 extra per ton for winter loading)	1.75
Oregon Ill.—Core, furnace lining	1.50@2.00
Sand blast	3.50
Stone sawing	3.50
Ottawa, Ill.—Core, furnace lining, molding, steel, traction, roofing sand	2.00
Brass molding	3.00
Sand blast	3.50
Stone sawing	3.50
Core and molding coarse (crude)	1.25@1.50
Ottawa, Minn.—All crude silica sand	.75@1.00
Rockwood, Mich.—Core	1.90
Roofing	3.00
Sand blast	3.75
Round Top, Md.—Glass sand	1.75@2.00
Core, furnace lining	1.45
Traction	1.60

(All per 2000 lb.)

Miscellaneous Sands

(Continued)

San Francisco, Cal. (Washed and dried)—Core, molding fine, roofing sand and brass molding	3.00@3.50
Direct from pit.	
Furnace lining, molding coarse, sand blast	3.60
Stone sawing, traction	2.30
Thayers, Pa.—Core	2.00
Furnace lining	1.25
Molding fine and coarse	1.25
Traction	2.00
Utica Ill.—Core	1.00
Furnace lining	1.00
Molding fine	.85
Molding coarse	1.00
Stone sawing	1.00
Utica, Pa.—Core	1.25@2.25
Molding fine and coarse, traction, brass molding	2.00
Warwick, O. — Core, furnace lining, molding fine and coarse (damp, 1.75) dry	2.25
Traction, brass molding (dry)	2.00
Zanesville, Ohio—Core	2.00
Furnace lining	6.00
Molding fine	1.75@2.00
Molding coarse	1.75
Brass molding	1.75@2.00

Talc

Prices given are per ton f. o. b. (in carload lots only) producing plant, or nearest shipping point.

Baltimore, Md.—Ground talc (20-50 mesh), bags	10.00
Ground talc (150-200 mesh), bags	12.00
Cubes	50.00
Blanks (per lb.)	.07
Chatsworth, Ga.—Grinding	6.00
Ground talc (150-200 mesh); bags	10.00
Pencils and steel workers' crayons (gross)	1.50@ 2.50
Chester, Vt.—Crude talc	5.00
Ground talc (150-200 mesh), bulk	7.00@ 8.50
Emeryville, N. Y.—200-325 mesh; bags	14.75
Glendale, Calif.—Ground talc (150-200-mesh)	16.00@30.00
(Bags extra)	
Ground talc (50-300 mesh)	13.50@15.50
200 mesh	13.50@14.50
Hailesboro, N. Y.—Ground talc (150-250 mesh), bags	18.00
Henry, Va.—Crude talc (lump mine run) per 2000-lb. ton	2.75@ 3.50
Ground talc (20-50 mesh), bags	8.75@10.00
(150-200 mesh), bags	9.75@12.50
Los Angeles, Calif.—Ground talc (200 mesh) (includ. bags)	16.00@20.00
Mertztown, Pa.—Ground talc (20-50 mesh); bulk 4.50, bags	5.50
(150-200 mesh); bulk 6.50, bags	7.50
Natural Bridge, N. Y.—Ground talc (150-200 mesh) bags	12.00@13.00
Rochester and East Granville, Vt.—Ground talc (20-50 mesh), bulk	8.50@10.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@22.00
(Bags extra)	
Vermont—Ground talc (20-50 mesh); bags	7.50@10.00
Ground talc (150-200 mesh); bags	8.50@15.00
Waterbury, Vt. — Ground talc (20-50 mesh), bulk	7.50
(Bags 1.00 extra)	
Ground talc (150-200 mesh), bulk	9.00@14.00
(Bags 1.00 extra)	
Pencils and steel workers' crayons, per gross	1.20@ 2.00

Rock Phosphate

Raw Rock

Per 2240-lb. Ton

Centerville, Tenn—B.P.L. 72% to 75%	6.00@8.50
B.P.L. 65%	6.00
Gordonsburg, Tenn.—B.P.L. 68%-72%	4.50@5.00
Tennessee—F. o. b. mines, long tons, unground Tenn. brown rock, 72% B. P. L.	7.00
Mt. Pleasant, Tenn. — Analysis, .70 B.P.L. (2000 lb.)	6.50
Paris, Idaho.—2000 lb. mine run, B.P.L. 70%	3.60

(Continued on next page)

Roofing Slate

The following prices are per square (100 sq. ft.) for Pennsylvania Blue-Gray Roofing Slate, f. o. b. cars quarries:

Sizes	Genuine Bangor, Washington Big Bed, Franklin Big Bed	Genuine Albion	Slatington Small Bed	Genuine Bangor Ribbon
24x12	$10.20	$8.40	$8.10	$7.50
24x14	10.20	8.40	8.10	7.50
22x12	10.80	8.70	8.40	7.80
22x11	10.80	8.70	8.40	7.80
20x12	12.60	9.00	8.70	8.10
20x10	12.60	9.00	8.70	8.10
18x10	12.60	9.00	8.70	8.10
18x 9	12.60	9.00	8.70	8.10
16x10	12.60	8.70	8.40	7.80
16x 9	12.60	8.70	8.40	7.80
16x 8	12.60	8.70	8.40	7.80
18x12	12.60	9.00	8.70	8.10
16x12	12.60	8.70	8.40	7.80
14x10	11.10	8.40	8.10	7.50
14x 8	11.10	8.40	8.10	7.50
14x 7 to 12x6	9.30	8.10	7.50	7.50
	Mediums	Mediums	Mediums	Mediums
24x12	$ 8.10	$8.10	$7.20	$5.75
22x11	8.40	8.40	7.50	5.75
Other sizes	8.70	8.70	7.80	5.75

For less than carload lots of 20 squares or under, 10% additional charge will be made.

(Continued from preceding page)

Ground Rock

Wales, Tenn.—B.P.L. 70%, Per 2000-lb. Ton	7.75
Barton, Fla. — Analysis, 50% to 65% B.P.L.	3.50@8.00
Centerville, Tenn.—B.P.L., 60-65%	5.00@6.00
B.P.L. 75% (brown rock)	12.00
Columbia, Tenn.—B.P.L. 68% to 72%	5.50
B.P.L. 65% (90% thru 200 mesh) bulk	5.50
Montpelier, Idaho — Analysis, 72% B.P.L., crushed and dried	3.75
Mt. Pleasant, Tenn.—B.P.L. 65%	5.50@6.00

Florida Soft Phosphate

Raw Land Pebble

	Per Ton
Florida—F. o. b. mines, long ton, 68/66% B.P.L.	3.00
68% (min.)	3.25
70% (min.)	3.50
Jacksonville (Fla.) District	10.00@12.00

Ground Land Pebble

	Per Ton
Jacksonville (Fla.) District	14.00
Add 2.50 for sacks.	
Morristown, Fla.—26% phos. acid	16.00
Mt. Pleasant, Tenn.—65-70% B.P.L.	5.00@ 6.00

Special Aggregates

Prices are per ton f. o. b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco chips
Chicago, Ill.—Stucco chips, in sacks f.o.b quarries		17.50
Deerfield, Md. — Green; bulk	7.00	7.00
Easton, Pa.—Evergreen, creme green and royal green marble	20.00@22.00	16.00@20.00
Slate granules		7.00@ 7.50
Granville, N. Y. — Red slate granules		7.50
Ingomar, Ohio	10.00@12.00	10.00@25.00
Lincoln, Neb. — Red, white, grey, in bags		30.00
granite; sacks	28.50@30.00	20.00@22.50
Marble chips, white, pink, creole, black		27.50
green		37.50
sparklets (bags extra)		50.00
Milwaukee, Wis.		20.00@30.00
New York, N. Y.—Red and yellow Verona		32.00
Middlebrook, Mo.—Red		25.00@30.00
Phillipsb'g, N. J.—Green stucco dash	20.00@22.00	16.00@20.00
Piqua, O.—Marble		7.00@ 9.00
Poultney, Vt. — Roofing granules		7.50
Red Granite, Wis.		7.50
Sioux Falls, S. D.	7.50	7.50
Tuckahoe, N. Y.		10.00@14.00
Whitestone, Ga.—White marble chips, net ton in bulk, f.o.b., bags		
15c extra	5.00	5.00

Concrete Brick

Prices given per 1,000 brick, f. o. b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	16@18.00	25.00@32.50
Birmingham, Ala.	15.00	30.00
Carpenterville, N. J.	15.00	31.50
Easton, Pa.	16.00	40.00@60.00
Eugene, Ore.	25.00@26.00	50.00@75.00
Friesland, Wis.	20.00	32.00
Houston, Tex.		19.50
Omaha, Neb.	18.00	30.00@40.00
Portland, Ore. (Del'd)	21.00	45.00@60.00
Puyallup, Wash.	20.00	30.00@75.00
Rapid City, S. D.	18.00	25.00@40.00
St. Paul, Minn.	15.00	30.00@35.00
Salem, Ore.	25.00	35.00@50.00
Salt Lake City, Utah	17.00@18.00	35.00@40.00
Seattle, Wash.	22.00	35.00@80.00
Springfield, Ill.	18.00	20.00@25.00
Tampa, Fla.	15.00	25.00@65.00
Wauwatosa, Wis.	13.00@14.00	27.00@65.00
Winnipeg, Can.	18.00	26.00

Sand-Lime Brick

Prices given per 1,000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

Barton, Wis.	10.50
Boston, Mass.	13.00@14.00
Buffalo, N. Y.	16.50
Dayton, Ohio	12.50@13.50
El Paso, Texas	13.00
Grand Rapids, Mich.	11.50
Lancaster, N. Y.	14.50
Michigan City, Ind.	11.00
Milwaukee, Wis. (delivered)	14.00
Minneapolis, Minn.	13.00
Plant City, Fla.	10.00
Portage, Wis.	15.00
Redfield, Mass.	15.00
Rives Junction, Mich.	11.00
Saginaw, Mich.	11.00
San Antonio, Texas—Common	15.00
South Dayton, Ohio	12.50@13.50
Syracuse, N. Y. (delivered at job)	18.00
f.o.b. cars	14.00
Washington, D. C.	14.50

Lime

Warehouse prices, carload lots at principal cities.

	Hydrate per Ton Finishing	Hydrate per Ton Common
Atlanta, Ga.	23.00	13.00
Baltimore, Md.	21.00	15.75
Cincinnati, Ohio	14.80	12.30
Chicago, Ill.	20.00	18.00
Dallas, Tex.	25.00	.....
Denver, Colo.	24.00	.....
Detroit, Mich.	18.00	13.25
Kansas City, Mo.	25.60	24.00
Minneapolis, Minn. (white)	25.50	22.00
Montreal, Que.	21.00	21.00
New Orleans, La.	.....	17.25
New York, N. Y.	16.80	13.10
Philadelphia, Pa.	15.50	14.50
St. Louis, Mo.	21.20	19.00
San Francisco, Calif.	22.00	16.00
Seattle, Wash. (paper sacks)	24.00	.....

	Lump per 180-lb. Barrel (net) Finishing	Common
Atlanta, Ga.	2.25†	1.85†
Baltimore, Md.	.....	15.00‡
Cincinnati, Ohio	.....	10.75‡
Chicago, Ill.	1.50†	1.40†
Dallas, Tex.	15.00‡	11.00‡
Denver, Colo.	.....	2.70†
Detroit, Mich.	.....	17.00‡
Kansas City, Mo.	2.34†	2.20†
Minneapolis, Minn.	1.70†	1.40†
Montreal	15.00‡	11.00‡
New Orleans, La.	2.40†	.....
New York, N. Y.	3.63½*	2.75@3.13½*
Philadelphia, Pa.	13.00‡	12.00‡
St. Louis, Mo.	.....	17.75‡
San Francisco, Calif.	.....	1.75†
Seattle, Wash.	2.80†	.....

*Per 280 lb. bbl. (net). †Per 180-lb. bbl. (net). ‡Per ton. Refund of 10c per bbl. Minneapolis quotes brown common lump lime: Kelly Island white is $1.55, Sheboygan $1.45. New York quotes hydrated lime "on cars" in paper sacks; lump lime "alongside dealers' docks" or "on cars."

Portland Cement

Current prices per barrel in carload lots, f. o. b. cars, without bags.

Atlanta, Ga.	2.80
Boston, Mass.	3.03
Cedar Rapids, Iowa	2.33
Cincinnati, Ohio	2.39
Cleveland, Ohio	2.36
Chicago, Ill.	2.05
Dallas, Tex.	2.25
Davenport, Iowa	2.28
Denver, Colo.	2.65
Detroit, Mich.	2.33
Duluth, Minn.	2.04
Indianapolis, Ind.	2.26
Kansas City, Mo.	2.45
Los Angeles, Calif.	3.00
Milwaukee, Wis.	2.22
Minneapolis, Minn.	2.29
Montreal, Can. (sacks 20c extra)	2.40
New Orleans, La.	2.83
New York, N. Y.	2.70
Pittsburgh, Pa.	2.14
Portland, Ore.	3.05
St. Louis, Mo.	2.35
St. Paul, Minn.	2.29
Toledo, Ohio	2.33
Seattle, Wash.	2.90

NOTE—Add 40c per bbl. for bags.

Gypsum Products— CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco* Calcined Gypsum	Cement‡ and Gauging Plaster	Wood Fiber	White§ Gauging	Sanded Plaster	Keene's Cement	Trowel Finish	Plaster Board ¼x32x36" Weight 1500 lb. Per M Sq. Ft.	Plaster Board ⅜x32x36" Weight 1850 lb. Per M Sq. Ft.	Wallboard, ⅜x32 or 48" Lengths 6'-10', 1850 lb. Per M Sq. Ft.
Douglas, Ariz.	.....	6.00	6.00	.....	13.00	.....	.....	.....	.....	.....	.....	.....	.....
Fort Dodge, Iowa	3.00	3.50	6.00	8.00	10.00	10.50	20.00	.....	21.30	20.00	20.00	.....	30.00
Garbutt, N. Y.	.....	.....	6.00	8.00	10.00	10.00	.....	7.00	.....	.....	.....	20.00	.....
Grand Rapids, Mich.	3.00	.....	5.00	10.00	10.00	10.00	.....	.....	31.00	.....	19.75	20.00	30.00
Hanover, Mont.	4.50	.....	6.00	10.00	.....	10.50	.....	.....	.....	.....	.....	.....	.....
Mound House, Nev.	.....	8.50	6.50	10.50@11.50	.....	.....	.....	.....	.....	.....	.....	.....	.....
Oakfield, N. Y.	3.00	4.00	6.00	8.00	10.00	10.00	20.20	7.00+	30.75	21.00	19.375	20.00	30.00
Rapid City, S. D.	4.00	.....	.....	10.00	12.00	12.50	.....	.....	33.75	.....	.....	.....	.....
Winnipeg, Man.	5.50	5.50	7.00	13.50	15.00	15.00	.....	.....	.....	.....	28.50	.....	35.00

NOTE—Returnable Jute Bags, 15c each, $3.00 per ton; Paper Bags, $1.00 per ton extra.
*Shipment in bulk 25c per ton less; ‡Bond plaster $1.50 per ton additional; +Sanded Wood Fiber $2.50 per ton additional; §White Moulding 50c per ton additional; ||Bulk; (a) Includes sacks.

News of All the Industry

Incorporations

The Jackson Gravel Co. has been incorporated in Jackson, Mich., for $10,000.

The New England Lime Co., Millerton, N. Y., has been incorporated for $1,500,000.

The Ebsary Gypsum Co., Manhattan, N. Y., has been incorporated for $200,000.

The Saluda Crushed Stone Co., Greenville, S. C., has been incorporated for $250,000.

The Ohio River Sand Co., Jeffferson, Ohio, has increased its capital from $36,000 to $300,000.

The American Gypsum Co., Port Clinton, Ohio, will erect a $20,000 factory and office building.

The Webster Concrete Products Co., Webster, N. Y., has been incorporated for $50,000 by G. R. Piper and A. Marquard. The attorney is W. B. Hanks, Rochester.

The Verter and Groves Sand Co., Groves Center, Kans., has been incorporated for $50,000 by W. E. Verter, F. B. Watkins and F. Y. Payne, all of Kansas City, Mo.

The Sun Portland Cement Co., Huntington, Ore., has been incorporated for $1,000,000 with H. A. Ross as president. Work is reported to have already been started on the plant.

The Hagerstown Lime and Chemical Co., Hagerstown, Md., has been incorporated for $30,000 by Jacob S. Myers, to develop 40 acres of lime marl land, and will put in a plant with a daily output of 150 tons of chicken grit.

Sand and Gravel

Frank A. Eldredge, Auburn, N. Y., is organizing a sand and gravel company in Fair Haven.

The New White River Sand and Gravel Co., Indianapolis, Ind., has filed a final certificate of dissolution.

The Summit Sand and Gravel Co., Terre Haute, Ind., has increased its capital stock from $10,000 to $100,000.

Oneida, N. Y.—The Syracuse Sand Co., of which James L. Bentley, Fish Creek, is vice-president, has ordered a duplication of the Rome barges for transporting sand from the company's sand bed at Mosquito Point, Port Byron.

The Fort Sand and Gravel Co., recently incorporated in Fort Worth, Texas, has been organized with H. P. Bonner, president; T. E. Popplewell, secretary; R. H. Quigley, treasurer, and will develop 66 acres of sand and gravel, putting in a plant to handle 45 to 65 cars per day.

Evansville, Ind.—A few of the sand and gravel companies along the lower Ohio and Wabash Rivers have ceased operations since winter weather started. Most of these companies are looking for a large volume of business this year, particularly in road and residence building.

Cement

The Giant Portland Cement Co. has declared a dividend of 2 per cent on the preferred stock.

The San Antonio Portland Cement Co., San Antonio, Texas, will begin the erection of a sack house.

The Petoskey Portland Cement Co., Petoskey, Mich., recently suffered a fire loss of $60,000 on its office building.

The Clinchfield Portland Cement Co., Kingsport, Tenn., has increased its capital stock from $1,500,000 to $2,000,000.

The New Egyptian Portland Cement Co., Port Huron, Mich., plans beginning operations not later than March 15.

The Alpha Portland Cement Co. has let the contract for erection of a cement storage building 70x125 ft., at La Salle, Ill.

The Huron Portland Cement Co. is preparing plans for rebuilding its warehouse at Detroit, Mich., which was recently burned.

The Columbia Chemical Division of the Pittsburgh Plate Glass Co., W. L. Clause, president and chairman of the board, will start work on a $2,000,000 cement plant at White Cottage, seven miles from Zanesville, Ohio.

The Missouri Portland Cement Co. reports from its Memphis office a good December trade in sand, cement and gravel, especially on larger work, not extraordinarily active on general work. The company is also making enlargements on its new plant in North Memphis.

The Southwestern Portland Cement Co., Victorville Cal., at a meeting of the directors, plan to enlarge the capacity of its plant to 5,000 bbl. per day. The contemplated plans for the enlargement of the plant include another kiln, a new rock crushing plant, new finish mill, enlargening of clinker bins, an electric crane for handling clinkers, and enlargening of the power house, four more slurry tanks, etc.

Phosphate Rock

The Phosphate Products Co. has been organized at Spokane, Wash., to develop phosphate deposits near Phillipburg, Mont.

The Rhum Phosphate and Chemical Co., Mt. Pleasant, Tenn., has been incorporated for $75,000 by J. Rhum, Jr., C. Y. Clarke, S. L. Jones, J. H. Hayes and Mollie S. Rhum.

The Coronet Phosphate Co., Plant City, Fla., will resume mining operations at its plants near Coronet, Hillsborough and Pembroke, after having been closed down since the first of July. The company employs 300 men when operating at full capacity.

Quarries

The Alabama Mineral Co. has been organized to develop an asphalt rock mine near Florence, Ala. C. W. Ashcraft is president and general manager, and Tyler Calhoun, Nashville, secretary and treasurer.

Cobleskill, N. Y.—The Norton Lime and Stone Co. has unloaded a Thew electric shovel which is to be put in operation at the quarries. The shovel weighs nearly 40 tons and the dipper has a capacity of 1½ cu. yd.

Dealers

The Acme Coal and Stone Co., Wilmington, Del., has been incorporated for $200,000.

The Coast Concrete Products and Building Corp., Vernon, Calif., has been incorporated for $50,000.

The Malow-Barry Co., Detroit, Mich., has been incorporated for $100,000 to handle building material.

The Inland Builders Supply Co., Spokane, Wash., has been incorporated for $15,000, by G. M. Yeomans and others.

The Builders' Supply and Concrete Products Co., Buffalo, N. Y., has been incorporated for $250,000 by F. L. and S. L. Hoff and F. E. Wheeler.

Olmstead, Kent & Co., Orlando, Fla., has been incorporated for $25,000 to engage in the contractors' supplies business. L. L. Olmstead is president, Roscoe Kent vice-president and R. E. Duckworth secretary and treasurer.

The Cook County Sand and Gravel Co., 224 South Michigan avenue, Chicago, has been incorporated by G. F. Leibrandt, C. A. White and O. W. Rosenthal to manufacture and deal in building material and products. Victor P. Frank, 105 North Clark street, is correspondent.

Manufacturers

The Northwest Engineering Co. announces that H. A. Hutchins, well known in his former connection with the Thew Shovel Co., has become associated with the main office of the Northwest Engineering Co. at 1220 Steger building, Chicago. Mr. Hutchins has been with the sales force of the Thew Co. since 1917 and was its district manager of the Chicago territory up to the time of joining the Northwest organization on December 15.

The Mackintosh Engineering Co., Schofield building, Cleveland, has been appointed agent for the Brownhoist small cranes, buckets and storage bins for Ohio, with the exception of Hamilton county. Included among these locomotive cranes will be a complete line of steam, gas engine and electric cranes mounted on creeper trucks, road wheels or four or eight-wheel railroad trucks. Mr. Mackintosh and his organization have been active in the distribution of small crane equipment in this territory for a great many years.

The Chain Belt Co., Milwaukee, announces the appointment of Fitch S. Bosworth as manager of its Chicago office, effective January 1. Mr. Bosworth has been in charge of the company's St. Louis office for the last three years and has specialized on chain and conveying engineering problems. With him will be associated Raymond X. Raymond, who for several years has been connected with the export sales department in Milwaukee. Thomas F. Scannell, formerly of the Chicago office, has been placed in charge of the St. Louis office.

The Bucyrus Co., South Milwaukee, Wis., announces the addition to its sales force of John J. Gault, associate member, A. S. C. E. Mr. Gault has had many years of experience as construction and locating engineer, having been assistant engineer on the Chicago & Northwestern; engineer maintenance of way on the Chicago & Alton; construction engineer for the United Fruit Co., and assistant engineer on the Chicago, Milwaukee & St. Paul. His last connection was with the International Harvester Co., as locating engineer on a railroad project. He will be attached to the Bucyrus Co.'s Chicago office at 622 McCormick building.

Personal

J. Fred Reinoehl has assumed the post of general manager of the Ramoth Lime and Rock Co.'s plant at Lime Rock, Pa.

F. O. Earnshaw has been promoted to the position of operating manager of the Carbon Limestone Co., Hillsville, Pa. Mr. Earnshaw formerly held the position of general superintendent of the company.

Harold E. Saylor, Fort Wayne, Ind., Indiana representative of the Sandusky Cement Co., Cleveland, Ohio, was married recently to Miss Irene Isabel Liggett of Fort Wayne. The couple will make their home in Fort Wayne.

G. C. Randle has been appointed district manager of the Car Service Division, with headquarters at Dallas, Texas, effective January 1. He will have the authority of the Car Service Division in Texas, New Mexico, Oklahoma, Colorado, Louisiana and Arkansas and other outlying points as may be directed.

T. E. Doremus, for the past three and a half years representing E. I. du Pont de Nemours & Co. as general Eastern manager for the Orient, with headquarters at Shanghai, China, has returned to the United States. Mr. Doremus is now located at Seattle, Wash., where he is manager for the company's explosives department.

Obituary

Edward A. Barr, 36 years old, general manager of the New Castle Lime and Stone Co., New Castle, Pa., for the past three yeras, died suddenly at the Harrisburg General Hospital, of pneumonia. Besides his father, he is survived by his wife and two children and two sisters.

John B. Ittenbach, 59 years old, chairman of the board of directors of the G. Ittenbach & Co., producers and contractors of cut stone, Indianapolis, died recently of pneumonia at his home. He was born in Indianapolis and had lived there all his life. He was a graduate of the University of Notre Dame and was a member of the company for 40 years. The company was founded by his father in 1865.

Buyers' Directory
of the Rock Products Industry

Classified Directory of Advertisers in Rock Products

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BARRELS—Lime
Draper Mfg. Co., The, Cleveland, Ohio.

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Robins Conveying Belt Co., New York City, N. Y.

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Weller Mfg. Co., Chicago, Ill. (storage)

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Bacon, Earle C., Inc., New York City.
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Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Webster Mfg. Co., The, Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

BLASTING SUPPLIES
Atlas Powder Co., Wilmington, Del.
Grasselli Powder Co., Cleveland, Ohio.

BUCKETS—Elevator
Greenville Mfg. Co., Greenville, Ohio.
Hendrick Mfg. Co., Carbondale, Pa.
Link-Belt Co., Chicago, Ill.
Orton & Steinbrenner, Chicago, Ill.
Webster Mfg. Co., The, Chicago, Ill.

BUCKETS
McMyler Interstate Co., Cleveland, Ohio.

CABLEWAYS
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Link-Belt Co., Chicago, Ill.

CALCINING MACHINERY
Ehrsam & Sons Co., J. B., Enterprise, Kans.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.

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Watt Mining Car Wheel Co., Barnesville, Ohio.

CAR PULLERS
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Mining Machine Co., Mountville, Pa.
Weller Mfg. Co., Chicago, Ill.

CEMENT MACHINERY
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

CHAIN
Carroll Chain Co., The, Columbus, Ohio.
Morse Chain Co., Ithaca, N. Y.

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Greenville Mfg. Co., Greenville, Ohio.
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Smith Eng. Works, Milwaukee, Wis.
Robins Conveying Belt Co., New York City.
Sturtevant Mill Co., Boston, Mass.
W. Toepfer & Sons Co., Milwaukee, Wis.
Universal Road Mach. Co., Kingston, N. Y.
Webster Mfg. Co., The, Chicago, Ill.

CRANES—Crawling Tractor
Industrial Works, Bay City, Mich.

CRANES—Locomotive, Gantry
Byers Mach. Co., The, Ravenna, Ohio.
Erie Steam Shovel Co., Erie, Pa.
Industrial Works, Bay City, Mich.
Koehring Co., Milwaukee, Wis.
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Ohio Locomotive Crane Co., Bucyrus, Ohio.
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Buchanan Co, Inc., C. G., New York, N. Y.
Chalmers & Williams, Chicago, Ill.
Ehrsam & Sons Co. J. B., Enterprise, Kan.
Good Roads Machinery Co., Kennett Square, Pa.
Gruendler Pat. Crusher & Pulv. Co., St. Louis, Mo.
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Lewistown Fdry. & Mach. Co., Lewistown, Pa.
McLanahan-Stone Mach. Co., Hollidaysburg, Pa.
Morgan Engineering Co., The Alliance, Ohio.
New Holland Machine Co., New Holland, Pa.
Pennsylvania Crusher Co., Philadelphia, Pa.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Smidth & Co., F. L., New York, N. Y.
Smith Eng Works, Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Universal Crusher Co., Cedar Rapids, Iowa.
Universal Road Mach. Co., Kingston, N. Y.
Webb City-Carterville Fdy. & Mach. Wks., Webb City, Mo.

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Taylor Wharton Iron & Steel Co., High Bridge, N. J.

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ENGINES—Oil
Kahlenberg Bros. Co., Two Rivers, Wis.

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Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Webster Mfg. Co., The, Chicago, Ill.

EXCAVATORS
Erie Steam Shovel Co., Erie, Pa.
Koehring Co., Milwaukee, Wis.
Northwest Engineering Co., Chicago, Ill.

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Northwest Engineering Co., Chicago, Ill.
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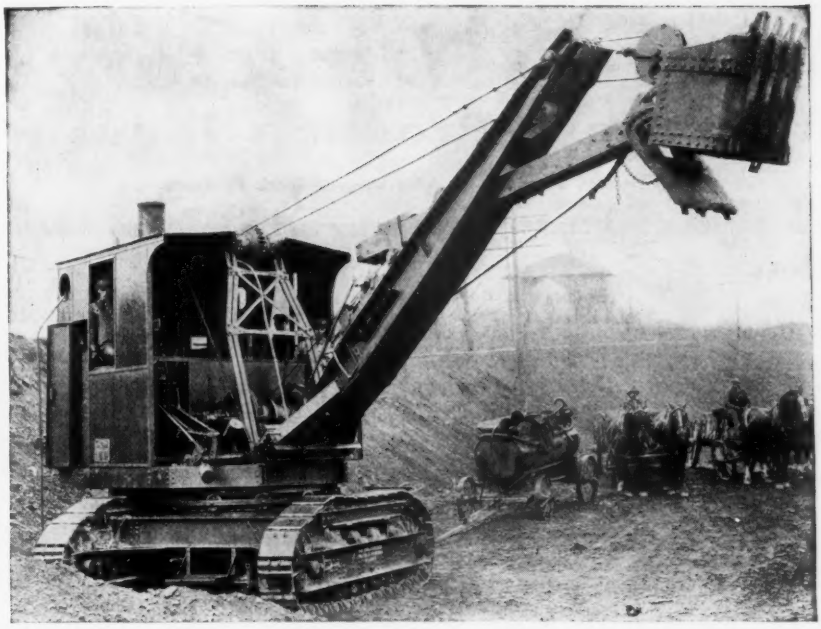

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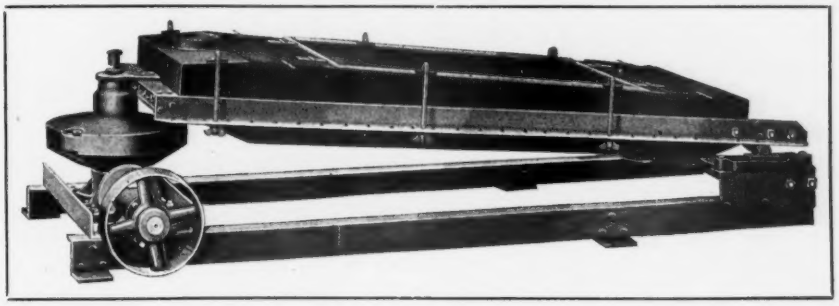

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The Ohio Gravel Ballast Co.
2103 Union Central Bldg.
Cincinnati, Ohio

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Deisel engine 500 to 750 horsepower in good running condition; one that can be direct connected to 600 K.V.A., Horizontal Generator 200 R.P.M. Give full particulars and lowest cash price.

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Gouverneur, St. Lawrence Co., N. Y.

IMMEDIATE SHIPMENT

2—Austin No. 3 Gyratory Crushers.
2—Bonnot 5′x22′ Compeb (tube) Mills.
1—Vulcan 8′x120′ Rotary Kiln.
1—Renneberg 5½′x45′ Ore Dryer.
4—American Process 4′x30′ Rotary Dryers.
1—Link Belt 20-Ton Hourly Coal Crusher.
2—Hardinge 8′ Conical Mills.
Raymond, Kent and Fuller Mills.
Swing Hammer Mills, all makes.
Buchanan and Sturtevant Crushing Rolls.
Jaw, Gyratory and Disc Crushers.
Complete Experimental Cement Plant.

High Grade Used Machinery for the Entire Rock Products and Non-Metallic Industry Our Specialty

American Machinery Equipment Co., P. O. Box No. 292, Charlotte, N. C.

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30 New Direct Fired Rotary Dryers, 4 ft. — in. diameter, 30 ft. long

These Dryers were about to be put into operation as the armistice was signed, and consequently were never used. We are offering them at a sacrifice, complete with driving mechanism, furnace iron, grates, etc. Some are equipped with steam radiators for steam heated air drying.

McDERMOTT BROS. CO.
Allentown, Penna.

Wanted

No. 7½ Gyratory Crusher. State full particulars.

DOLESE BROS. CO.
337 West Madison Street Chicago

WANTED

A good used pulverizer that will make thirty to fifty tons per ten hours, one-quarter to dust. American Ring Pulverizer preferred. Address

Cole Bros., Vanlue, Ohio

Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid in advance of insertion

Telephone Court 4508-4509

H. R. EICHER

608-609 Maloney Bldg. Pittsburgh, Penna.

We have purchased from the Consolidation Coal Co. and the Cumberland & Pennsylvania R. R. Co. all of their Surplus Equipment. In this lot we have listed below some of the items and equipment that might be of interest to you at a very low figure. This material is all in A-1 condition, mechanically and otherwise, and will be loaded f. o. b. Frostburg, Md., and can be inspected at that point. Detailed specification on any item obtainable at our Pittsburgh office.

1—Norwalk 3-stage Air Compressor, straight line with intercoolers; steam pressure 125 lb.; air pressure 900 lb.; capacity 750 cu. ft. at 85 R.P.M. $2000.00

1—Ingersoll Duplex Cooper-Corliss, steam pressure 125 lb.; air pressure 900 lb.; capacity 1409 cu. ft. free air at 80 R.P.M. $2000.00

2—Ingersoll-Rand Imperial Type 10, capacity 1319 cu. ft. per minute; piston displacement at 150 R.P.M.; complete with 1-KY General Electric 200 H.P. Motor 3-phase, 60 cycle, 220 volts; 600 R.P.M. with C. R. 1034-H3 Compensator base and pulley 24x32x5; also complete with Air Receivers, Gauges, Fittings, etc. $3500.00 each

1—Ingersoll-Rand Class J-2 single acting 2-stage 24¼x14¼x18 in.; capacity 1000 cu. ft.; maximum pressure 100 lb. at 135 R.P.M.; complete with 1-200 H.P. Westinghouse Motor 3-phase, 60-cycle, 220 volts with slide rails, pulley and starting device; also 1-55 ft. 21-in. 2-ply Endless Leather Belt; complete with Air Receivers, Gauges, Fittings, etc. $3500.00

3—Air Receivers, 30-in. dia. x 20 ft. long, tested 1000 lb. pressure. $75.00 each

1—Air Receiver, 60 in. dia. x 12 ft. long, tested 150 lb. pressure. $50.00

1—150 H.P. Butt strapped triple riveted H. R. T. Boiler, complete with stacks, fronts, fittings, buck-stays, etc. $600.00

2—Westinghouse Standard Steam Engines, 7½x7 in., 350 R.P.M., 20 H.P. $75.00 each

1—Case Steam Engine, 8 H.P., pulley 18 in. x 6½ face, flywheels 18x5½, 648 R.P.M. $20.00

1—110 K.W. Allis-Chalmers A.C. Generators, 2200 volts, 225 R.P.M. direct connected to Harrisburg steam engine 16x14, 150 H.P., 225 R.P.M. $2000.00

2—150 K.W. Westinghouse D.C. Generators, 250-275 volts, 550 R.P.M. $1250.00 each

1—160 H.P. Buckeye Generator Engine, 18x18¾, pulley 90 in. x 26 in., 200 R.P.M. $600.00

1—Westinghouse stand. engine, 7½x7 in., 350 R.P.M., 125 lb. pressure direct connected to 15 K.W. Wood Generator, type MPL Compound wound, 350 R.P.M. 125 volts, complete with switchboard, instruments, main line switches, fuses, etc. $50.00

1—7x10 Single Drum double cylinder Mine Hoist; drum dia. 40 in., face 40 in. $400.00

1—H. K. Porter Air Locomotive, 6 wheel, 16 ton, 36 in. gauge. $600.00

1—Baldwin Air Locomotive, 6 wheel, 16 ton, 36 in. gauge. $600.00

1—H. K. Porter Air Locomotive, 6 wheel, 15 ton, 36 in. gauge. $600.00

1—Baldwin Compound Locomotive, 10 ton, 36 in. gauge. $450.00

4—Baldwin Gathering Locomotives, 4 ton, 36 in. gauge. $450.00 each

1—Storage Oil Tank, 8 ft. diameter, 30 ft. long. $200.00

HOISTS
FOR SALE

Unused Emerson Brantingham Double Cylinder Single Drum Hoists in first-class condition, $125.00 each f.o.b. Chicago. Immediate shipment. Full specifications furnished on application. A real bargain.

Quantity Limited

Hyman-Michaels Co.
Peoples Gas Bldg. Chicago

2—50-ton standard gauge Baldwin 6-wheel switchers, built 1913.

1—42-ton standard gauge Heisler geared locomotive, built 1910.

1—42-ton standard gauge Shay geared locomotive.

1—12x18" standard gauge 4-wheel saddle tank.

1—23-ton new 36" gauge Porter 6-wheeler with separate tender.

10—5-ton 36" gauge storage battery locomotives.

1—14-B Bucyrus steam shovel, mounted on traction wheels.

Birmingham Rail and Locomotive Co.
Birmingham, Alabama

Machinery For Sale

DRYERS—Direct-heat rotary dryers, 3x25', 3½x25', 4x30', 5½x50', 6x60' and 7x60'; double shell dryers, 4x20', 5x30' and 6x35'; steam-heated air rotary dryers, 4x30' and 6x30'.

KILNS—Rotary kilns, 4x40', 5x50' and 6x70', 6x100', 7x80' and 8x110'.

MILLS—6x8', 6x5', 5x4', 3x3½' pebble and ball mills; 3' March mill; 42", 33" and 24" Fuller-Lehigh mills; 4½x20', 5x11', 5x20', 5½x22' and 6x20' tube mills; 7½x13", 9x15", 16x10" and 12x26" jaw crushers; one "Infant" No. 00, No. 0, No. 2, No. 3, and No. 9 Williams' swing hammer mills; one Kent type "G" mill; 24", 36" and 40" cage mills; 3' and 4½', 6' and 8' Hardinge mills; 18x12", 20x12" and 30x10" roll crushers; No. 0, No. 1 and No. 3 Sturtevant rotary crushers; one No. 2 Sturtevant ring roll crusher; 5 roll and 2 roll No. 1 and No. 000, No. 00 and No. 0 Raymond mills; one No. 3 and No. 4 and No. 7½ Telsmith breaker; one 36" Sturtevant emery mill; one 3 roll Griffin mill; 60" chaser mill.

SPECIALS—Five automatic package weighing machines; jigs; 6x8', 6x5' and 4x3' Newaygo vibrating screens; Richardson automatic scales; 8' and 10' Emerick air separators.

Air compressors.

W. P. Heineken, Engineer
95 Liberty Street, New York. Tel. Cortland 1841

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For Sale—STEAM SHOVEL

⅝ YD. THEW "O" TRACTION

Thoroughly rebuilt; attractive terms for quick sale.

Walter A. Zelnicker Supply Co., St. Louis
Rails, Locomotives, Cars, Tanks, Pipe

Mine Cars, Rails and Ties

We have mine cars in stock for all purposes. Also rails 12 lb. to 100 lb. section. Spikes, bolts, frogs and switches. All trade is solicited and prices cheerfully quoted.

M. K. FRANK
Frick Building Pittsburgh, Pa.

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We are opening up a gypsum hill in southern Wyoming. The analysis proved 99 72/100 per cent pure. We want to sell our output, raw material. If interested, write

Anton Novak, Wilber, Neb.

For prompt and satisfactory results in buying or selling a plant securing help or a position, use the Classified Department of ROCK PRODUCTS

Classified Advertising

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FOR SALE
All or Interest in

300 acres hard limestone land, with 1500x 30 ft. open quarry face. Large new, crushing and screening, plant of 3000 tons daily capacity; centrally located to large demand for material; orders amounting to $200,000 on our books.

Capable man with $25,000 up, and knowledge of business can make big money, if act promptly.

Location in Southwest.

Box 1603, Care of Rock Products
542 South Dearborn Street, Chicago, Ill.

MINING—MANUFACTURING ORGANIZATION

Young graduate mining engineer, proven executive ability, desires position. Experienced in labor jobs around mines, mills, and manufacturing plants. Six years in charge of operations, including mining, milling, manufacturing, and marketing. Exceptional references. Ad-

Box 1614, Care Rock Products
542 South Dearborn Street, Chicago, Ill.

WANTED

Quarry foreman for cement mill quarry in Lehigh District, Pennsylvania. Quarry produces about two thousand tons of stone per day with steam shovels. Foreman must look after loading, track work, and quarry transportation, strippings, drilling and blasting. State age and salary expected and give full experience with reference. Address

Box 1611, Care of Rock Products
542 South Dearborn Street Chicago, Ill.

Mr. Lime and Limestone Producer—

I am well qualified by experience, training and education for a connection in the operating, selling, or chemical department of the Lime and Limestone business. I want to make a connection with the man or the company that will give me the opportunity to grow and develop with the business. I am a young man with considerable experience. I can and have worked out problems in a practical way. Besides having a special training in chemistry I have a B. S. degree in Civil Engineering. During the last year I have visited many plants in the industry.

For the concern, large or small, that offers a good future—the chance for an executive position later on—I am your man.

That we may arrange to go over matters for our mutual satisfaction, please address me

Box 1615, Care Rock Products
542 South Dearborn Street, Chicago, Ill.

Take advantage of the Opportunity offered in the Used Equipment Department to dispose of the equipment that you no longer need.

WANTED

Quarry foreman to assume full charge and responsibility of operating our sand quarry and sand mill. State age, experience, nationality and salary expected. Address

Box 1616, Care of Rock Products
542 South Dearborn Street Chicago, Ill.

WANTED

To lease or purchase—going lime plant with hydrating equipment in Eastern or Southeastern States. Reply with some details, plant and quarry equipment. Preference given, White Magnesium Lime. Address

Box 1602, Care of Rock Products
542 South Dearborn Street Chicago, Ill.

SUPERINTENDENT

desires engagement, operation of ballast or crushed stone plant. Twenty years' experience handling labor, heavy machinery, heavy blasting and large production. Familiar with all details. Excellent references.

Address Box 1613, Care Rock Products
542 S. Dearborn St., Chicago, Ill.

WANTED

Superintendent of several years' experience with all kinds of crushing and separating machinery. Would like to locate with some good rock crushing and grinding plant or small cement plant. A permanent position desired.

Address Box 1595, Care of Rock Products
542 South Dearborn Street Chicago, Ill.

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Hard to Shoot—But Note the Clean Pull!

NOTHING to stop the shovels from going right to work and working *clear up to the face!*

Where hard shooting problems arise the best results are obtained by using Nitro Glycerine, Ammonia and Gelatin grades.

Grasselli makes them all!

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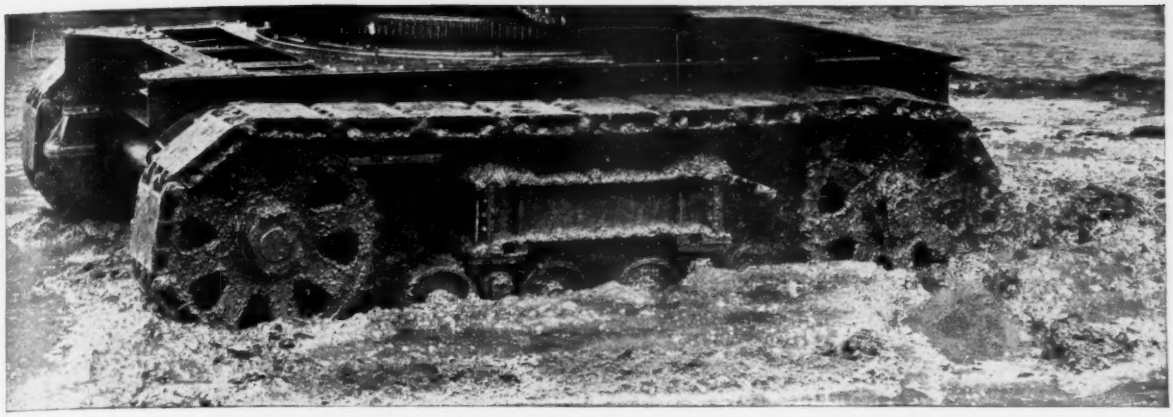
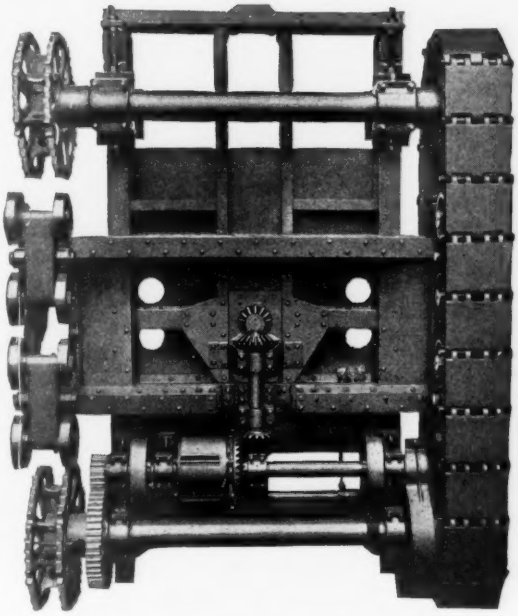
GRASSELLI EXPLOSIVES



Brownhoist No. 2 Creeper Truck Crane traveling through heavy mud

Rugged Power in Creeper Trucks



Under side of Creeper Trucks with track and gear casings on left side removed.

The operator of a Brownhoist Creeper Truck Crane has that feeling of confidence that comes with the knowledge of plenty of reserve power, easily controlled. From his seat in the cab he steers his crane and sends it up hill, through sand or heavy going. Taking the travel as it comes, he knows his crane will always be on the job and ready for work.

Heavy structural beams, well braced, 7 inch drop-forged axles, and sturdy load rollers set in equalizing trucks carry the heavy loads and keep them distributed throughout the entire length of the creeper track. Positive gear drive, well up out of the dirt and running in oil where the wear comes keeps the Brownhoist creepers going where others might stall.

The Brownhoist No. 2 Locomotive Crane is good all the way through, and a fast, dependable worker. Let us tell you more about what this crane will do for you.

The Brown Hoisting Machinery Co., *Cleveland, O.*

Branch Offices: New York, Chicago, Pittsburgh, San Francisco, New Orleans

BROWNHOIST

MATERIAL HANDLING EQUIPMENT

The Only Journal With a Paid Circulation in the Rock Products Industry

Rock Products

Entered as second-class matter, July 2, 1907, at the Chicago, Illinois, Postoffice, under the Act of March 3, 1879.

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"Worth More Than All Others Together"

THE following letter, written from Roanoke, Va., January 20, by W. W. Boxley and addressed to Nathan C. Rockwood, tells the story of the Crushed Stone Convention better than pages of description could do:

"My dear Colonel:

"I reached home yesterday from Chicago, and I want to say that the convention was worth more to me as a stone man than all the conventions put together that the National Crushed Stone Association has had.

"I am very anxious to get a full report of everything that was done and said in this convention. Just before leaving I took the matter up with Secretary Sandles, and he said the full proceedings, including all the speeches the young lady was taking down, would be printed in ROCK PRODUCTS.

"We are subscribers to ROCK PRODUCTS and have been for many years, but I would like for you to send me a half dozen extra copies of the issue containing these proceedings, and send the bill along with these copies and I will remit at once. I would also like for you to send a copy of this issue to R. G. Lassiter, Raleigh, N. C. Mr. Lassiter is the largest producer of crushed stone in the Carolinas, I think."

Mr. Boxley was correctly informed concerning the publication of the convention report. All papers and discussions will be edited and published in the March 10 issue of ROCK PRODUCTS as the official proceedings of the convention. This will produce a Quarry Manual which will mark the beginning of permanent quarry literature. Nowhere does there exist today under one cover such a complete, comprehensive, and authoritative treatment of nearly every phase of quarry operation and management as will appear in this March 10 issue. If Mr. Boxley, who attended each session of the convention and derived such benefit from it, finds half a dozen copies of this issue necessary, what will the hundreds of quarry operators who were not so fortunate as to attend require? Orders for extra copies of this issue should be placed now, to make sure of getting them before the supply is exhausted.

* * *

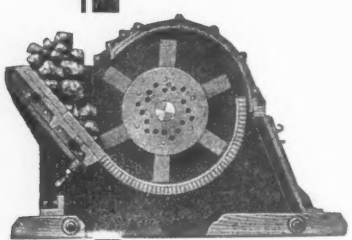
How the Other Fellow Does It

INSPECTION trips of 10,000 to 15,000 miles and lasting six or eight weeks are expensive items when charged against the profits of a gravel, stone, or lime plant. For C. E. Wood, gravel producer of Los Banos, Calif., or H. A. Major, lime and stone producer of Salt Lake City, such inspection trips as are described in this and the preceding issues of ROCK PRODUCTS are fine things. For all producers they would be fine, except that the cost in time and money makes them in most cases prohibitive.

That desire to "find out how the other fellow does it" is satisfied and the valuable lessons from the other fellow's installations are gained almost equally well by a careful and regular reading of ROCK PRODUCTS, the editors of which make not one inspection trip, but continuous trips of inspection, year in and year out, to inspect and report on all the latest and best installations.

The Bradbury plant is in the heart of Kansas City, 13th and Wyandotte Street

One Williams Replaces Two Other Crushers at E. H. Bradbury Plant



E. H. Bradbury is just one of many quarry operators who have cut rock crushing costs and simplified their crushing plants with Williams crushers. At the Bradbury plant, one Williams Jumbo is crushing 14" stone to macadam in one operation. Doing the same work which formerly required a Jaw crusher and Gyratory, and the finished product is better. Mr. Bradbury states that it is cubical in form (no slivers), assuring free flow of the rock between reinforcing bars and no air pockets when used for concrete.

"The product we are now getting is superior to that from the tandem Gyratory and Jaw breakers I have been using."
E. H. BRADBURY.

Plant executives and engineers are invited to describe their crushing operations to the Williams Engineering Department. Our recommendation with prices, service records and complete data furnished without obligation. Let us show you why most American cement plants use Williams crushers.

Williams Patent Crusher & Pulverizer Co.
800 St. Louis Ave., St. Louis, Mo.

Chicago
37 W. Van Buren Street

New York
15 Park Row

San Francisco
67 Second Street

THE WILLIAMS PATENT CRUSHER & PULVERIZER CO. ST. LOUIS, MO. U.S.A. TRADE MARK

Williams

PATENT CRUSHERS GRINDERS SHREDDERS

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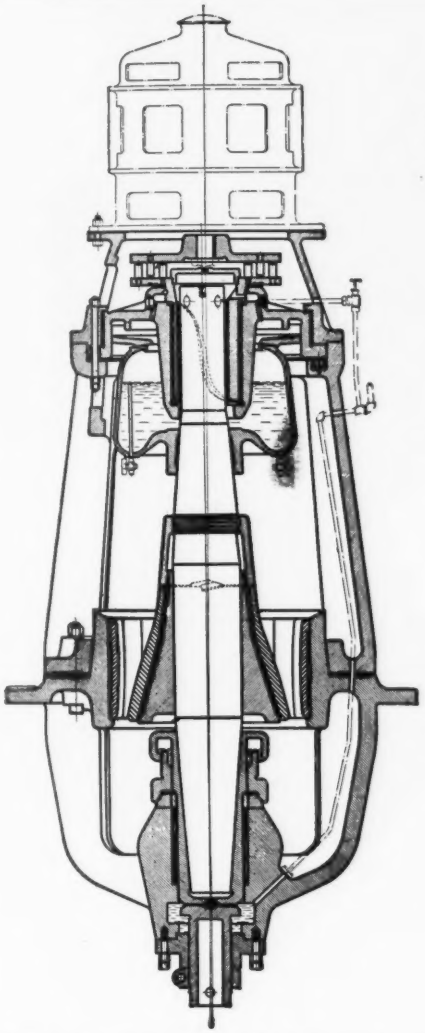
The New Weston Direct Drive Gyratory Crusher for Secondary Reduction of Hard Rock, Ore and Gravel



A Few Reasons Why You Should Install a Weston Crusher

1—Capacity is 3 to 5 times greater than geared gyratories.

2—Power consumption is unusually low due to the absence of friction losses caused by gears, belts, ropes, etc.

3—Lubrication is positive without pumps. Accurate tests on No. 36-A show a gallon of oil per minute flowing through main eccentric bearing.

4—After removing the six bolts which hold the motor stand to upper frame, all parts of the crusher are immediately accessible.

5—Unit construction simplifies plant design.

Built in six standard sizes — largest size takes 12″ rock rejecting 350-450 tons per hour. Smallest machine when set to 1¾″ rejects 120 tons per hour, or 40 tons per hour with ½″ setting.

Send for Bulletin 25 Which Describes This Machine in Detail

The Morgan Engineering Company

Alliance, Ohio

Pittsburgh
1420 Oliver Bldg.

Designers, Manufacturers and Contractors
Electric Traveling Cranes, Rolling Mill Machinery
Ordnance, Steel, Shipbuilding and Forging Plants Complete,
Rock Crushers, Special Machinery for Any Purpose

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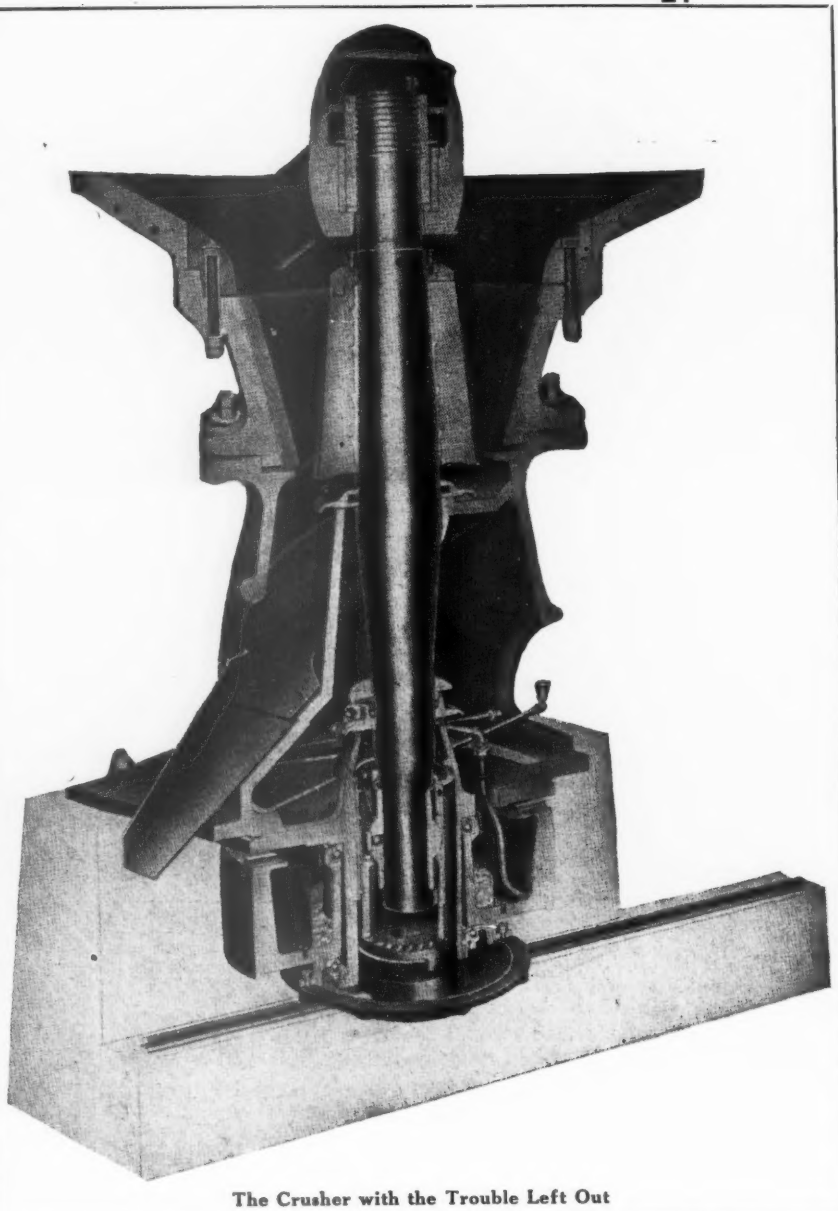
KENNEDY *GEARLESS* CRUSHERS

The Kennedy has revolutionized the rock crushing industry. It represents a definite step in advance, and is unquestionably the best, strongest, and most efficient unit known to rock crushing engineering.



The Crusher with the Trouble Left Out

Points of Superiority

1. Less Power Consumption
2. Low Operating Cost
3. Continual Operation—Not Limited to Safe Gear Speed—Strikes a Harder Blow, and Has Increased Capacity
4. Perfected Dust Proof Circulating Oiling System.
5. Can Be Set in Any Position—And Takes Less Room
6. Equipped with Patented Ball and Socket Eccentric.
7. Noiseless.

Parts Eliminated

1. Outboard Bearing
2. Counter Shaft
3. Inner Bearing Cap
4. Base, and Support
5. Thrust Ring
6. Pinion
7. Gear
8. Key for Gear
9. Two Steel Wearing Rings
10. Bronze Wearing Rings.

Parts Added

1. Set Balls
2. Ball Race Rings
3. Ball Retainer.

This improvement has actually reduced cost of maintenance 80%, not including head and concaves.

Write for Catalogue and Information

Kennedy Van Saun Mfg. and Eng. Corp.

120 Broadway, New York

Compagnie Des Entreprises Industrielles
40 Rue des Mathurins, PARIS

Harron Rickard & McCone, Inc., San Francisco and Los Angeles

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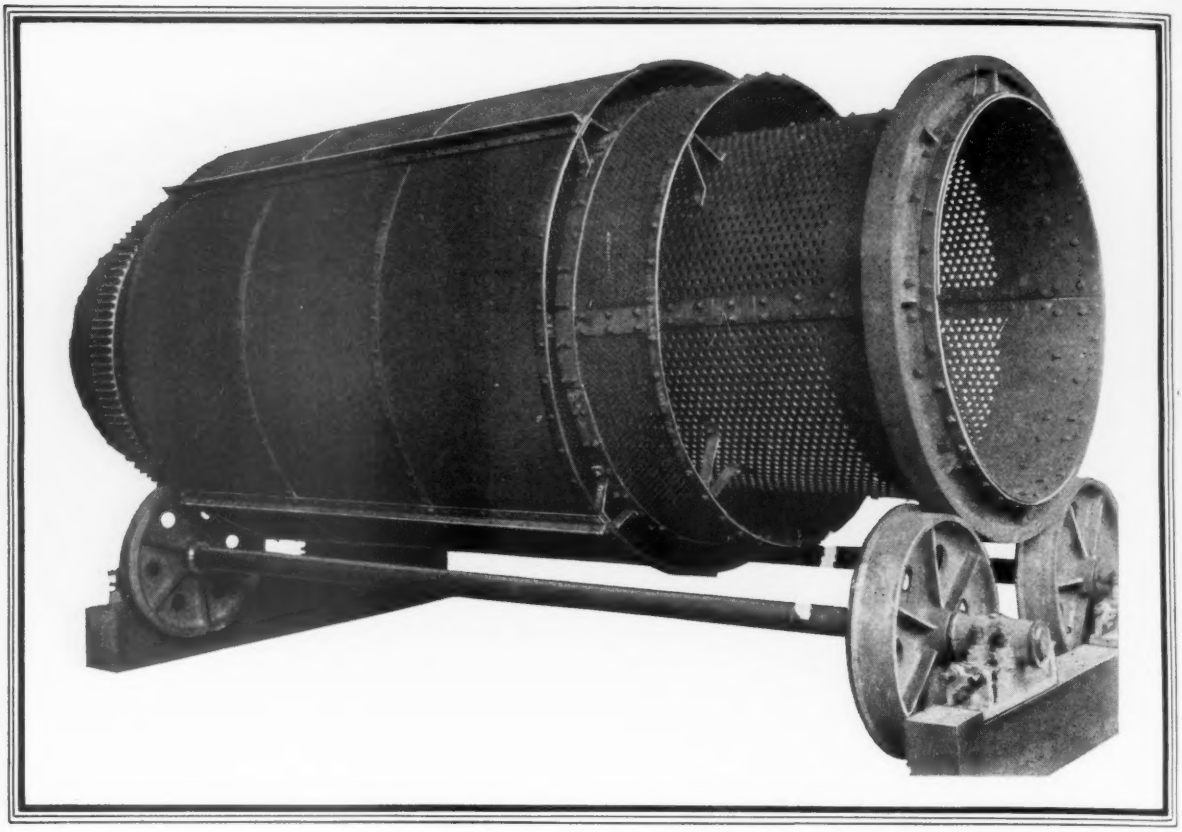

Webster Revolving Screens

For sand, gravel and stone screening, Webster Revolving Screens cannot be excelled. They are ruggedly built, as well as accurately designed, thus insuring years of reliable and dependable service.

Webster Revolving Screens are built in many styles and sizes with capacities to suit the individual installation. They can be equipped with screen plates which have round, square, oval or staggered perforations, depending upon the material to be screened.

Let our Engineers help you in the selection of proper screens, and screening machinery. They are at your service

THE WEBSTER MFG. COMPANY

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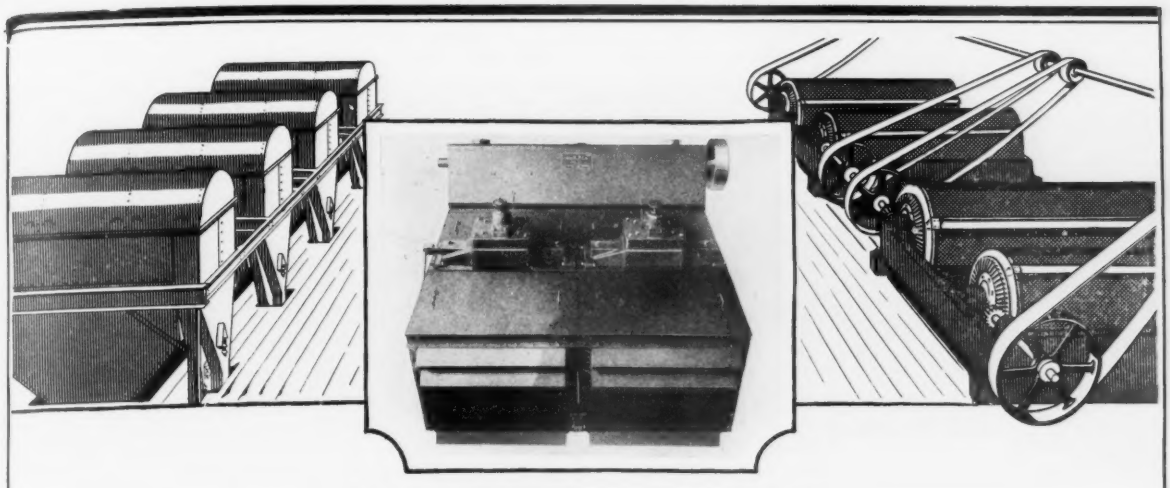


6 Foot, Type 31 Two Surface HUM-MER Electric Screen

Four HUM-MERS Do Work of 8 Revolving Screens

At a limestone plant in West Virginia, double jacket revolving screens 16 feet long by 4 feet in diameter were used in the raw end to produce a through 5-16 inch product, and similar screens 12 feet long by 4 feet in diameter were used in the finished end to remove minus 20 mesh material which seriously hampered the operation of their kilns.

They found that Four 8-ft., 2-surface HUM-MER *Electric* Screens would easily do the work of eight revolving screens. Moreover, the HUM-MERS reduced the percentage of minus 20 mesh material in the finished product to one half of one percent where it had run as high as 11% with revolving screens.

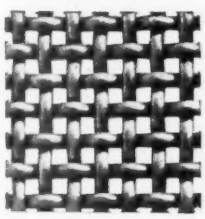
COMPARISON

	Revolving Screens	Hum-mer Screens
No. of machines	Four 16'x4' double jacket Four 12'x4' double jacket	Four 8-foot 2-surface
Amount Screen Area	2400 square feet	320 square feet
Horse-Power	80 horse-power	5 horse-power
—20 mesh retained in product	As high as 11%	Average of 00.5%

The revolving screens require 7½ times the screening area and 16 times the horse-power.

Operators of revolving screens will find it profitable to investigate the many advantages and economies to be had by installing HUM-MER *Electric* Screens.

Write us about your screening problem that we may show you the benefits of using HUM-MER'S.



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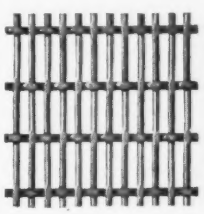
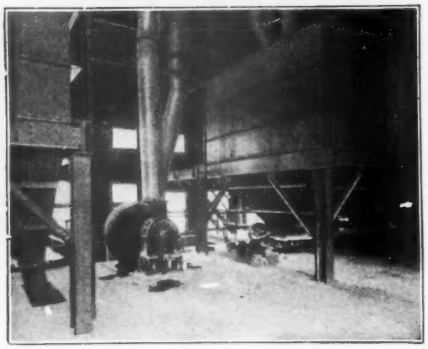
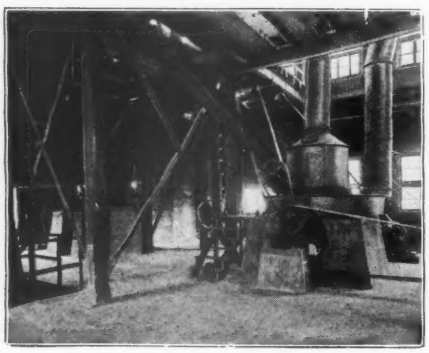




Raymond Special Exhaust Fan Direct Connected to Motor



Raymond Roller Mill with Gypsum Dryer in Background at Left

Raymond Roller Mills for Hydrated Lime

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For quality, fineness and low cost of production use **Raymond Equipment** between your hydrator and finished product bin.

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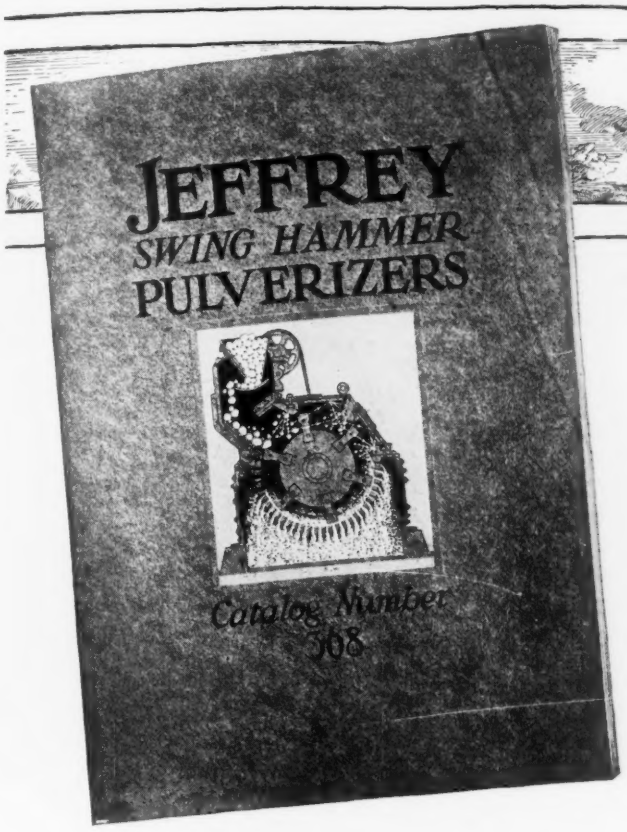

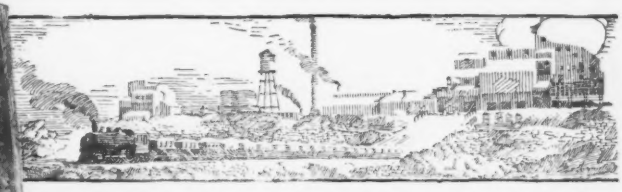

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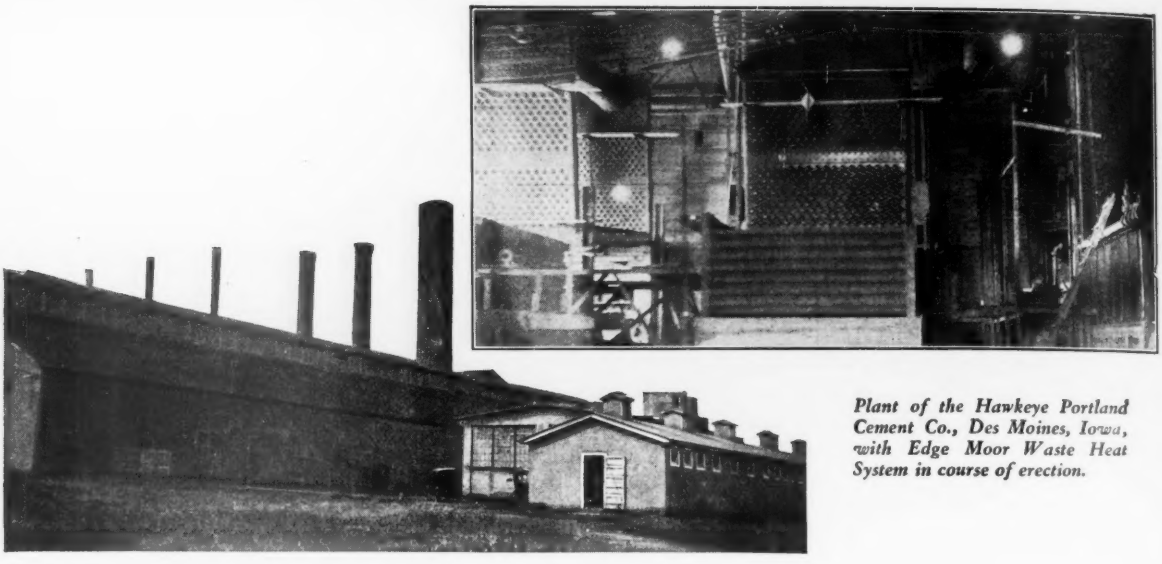

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